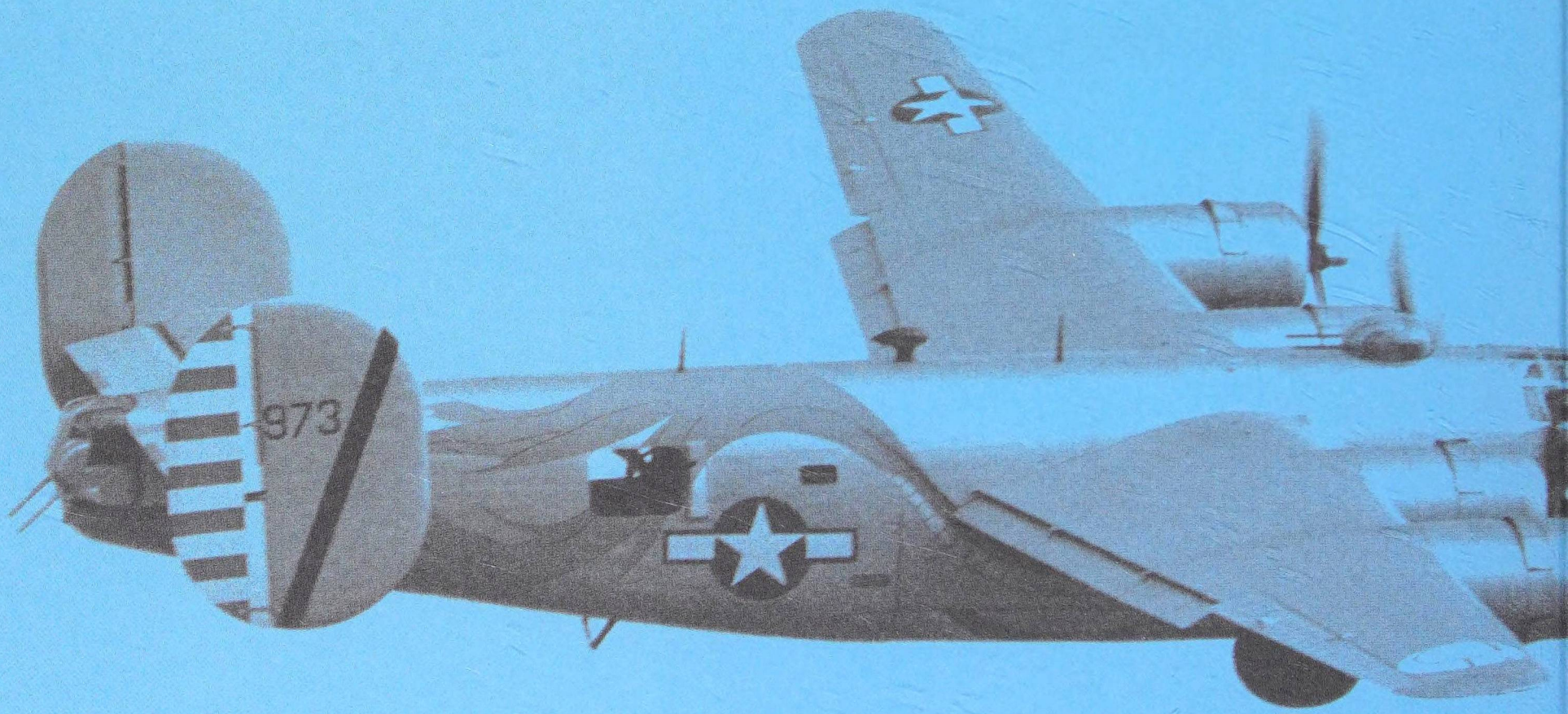
LEGENDS OF WARFARE

AVIATION

Consolidated B-24, Vol.2

The B-24G to B-24M Liberators in World War II

DAVID DOYLE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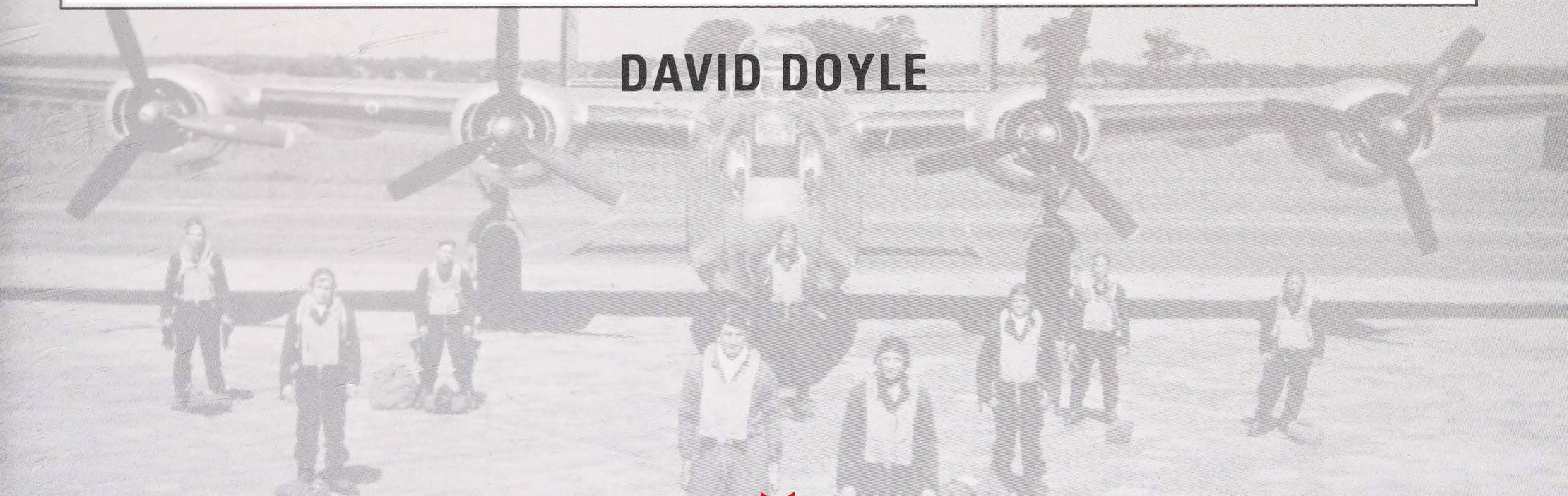

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Acknowledgments

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All photos by the author unless otherwise noted.

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Introduction

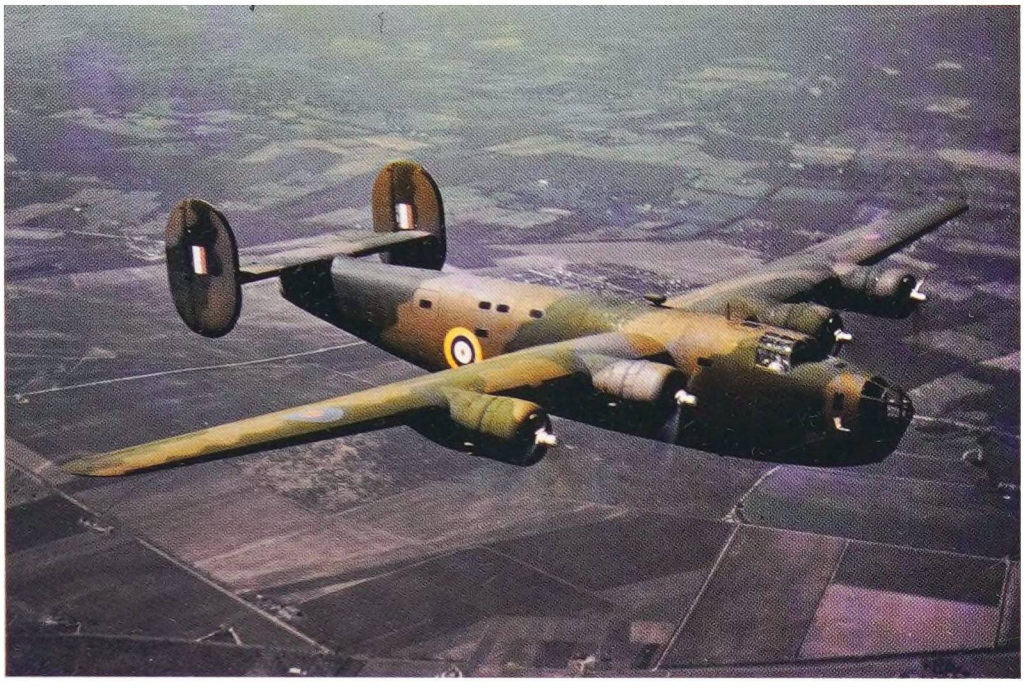
The progenitor of the Liberator family was the XB-24. Earmarks of the production Liberator are apparent, from the twin vertical tails to the stubby nose and expansive wings designed by David R. Davis. The dark areas on the fuselage and the vertical fins are shadows: the plane had an overall bare-aluminum finish. The XB-24 is seen here in flight on February 27, 1940. *National Museum of the United States Air Force*

The B-24 bomber was the most produced heavy bomber of World War II, and as of this writing, it is still the most produced heavy bomber aircraft, a record that is unlikely to be challenged. In the age of long-range missiles and increasingly costly aircraft, there is almost no chance that any other bomber will be built in the nearly 19,000-plane quantity of the Liberator.

The first several thousand B-24s were equipped with the so-called greenhouse nose, as detailed in volume 1 of this series on the Liberator. However, on June 30, 1943, the Ford Motor Company delivered B-24H-1-FO, serial number 42-7465—the first Liberator factory-assembled with a nose turret. This was followed in short order by the introduction of this feature on the North American Aviation–produced B-24G-1-NT.

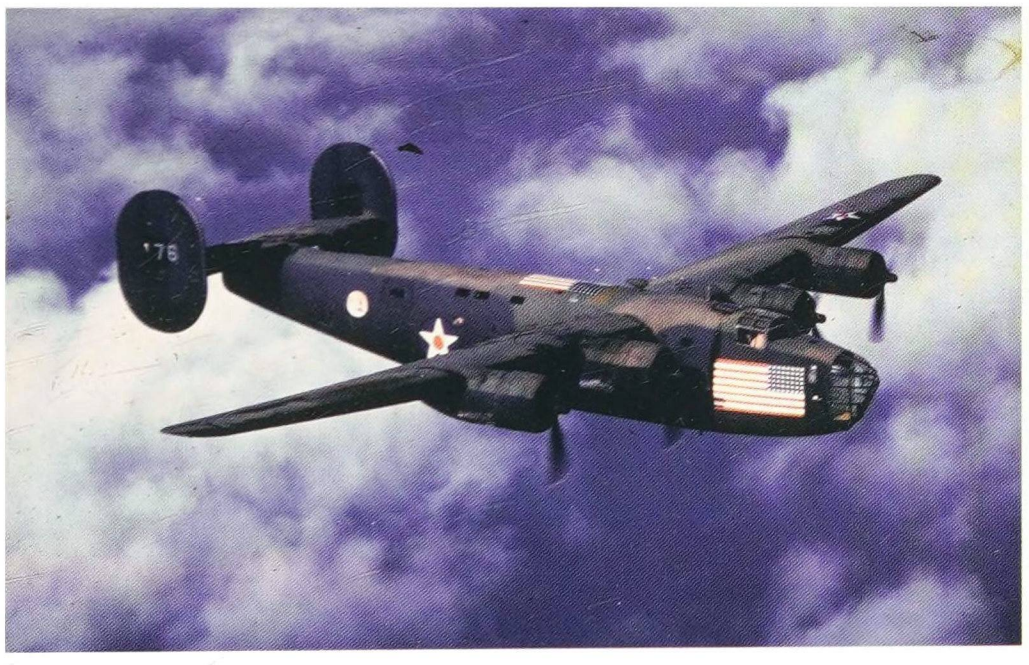
The nose turret would be a standard feature of all Liberators produced thereafter. While there was a turret of some type on the nose of all those B-24s, they were far from all alike. Different production blocks of aircraft used different turret assemblies, and the method of mounting varied depending on who manufactured the airframe. It is worth repeating from the first volume that Ford not only assembled aircraft in its own Willow Run facility but also supplied the airframes to Douglas in Tulsa and even Consolidated, later known as Convair, in Fort Worth, Texas.

Despite their once-abundant numbers, today only a few B-24s of any type remain. The B-24J shown in chapter 4, whether presented as "The Dragon and His Tail" or "Witchcraft," is today the only flying example of a nose-turret-equipped Liberator in the world. It has been restored and preserved and is operated by the Collings Foundation of Stow, Massachusetts.

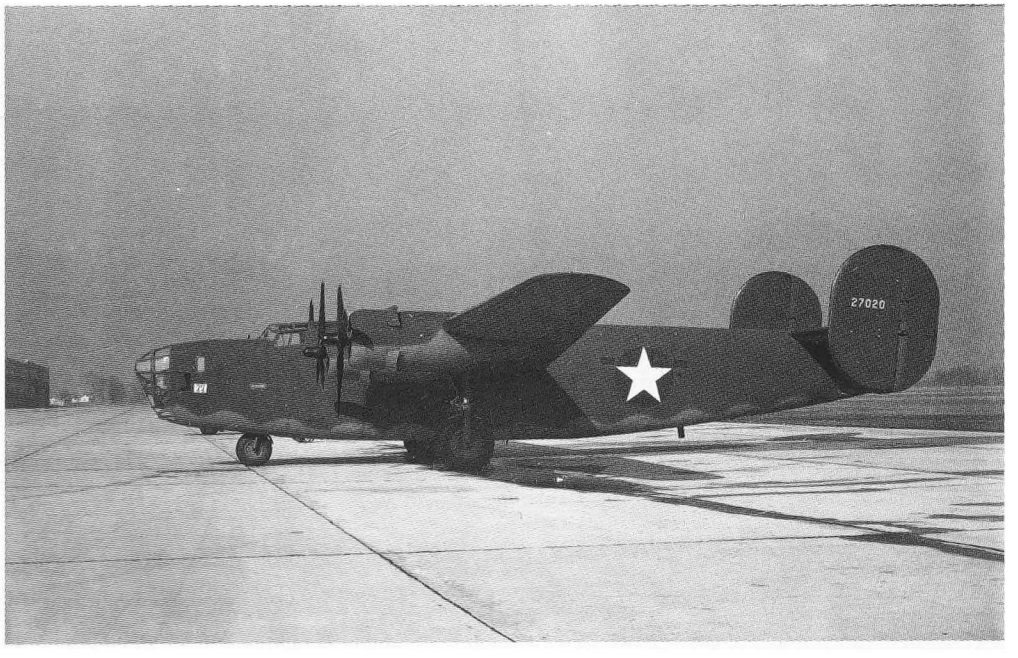


Before the XB-24 had its first flight, the US Army Air Corps ordered seven service-test examples of the plane, designated the YB-24. These planes differed from the XB-24 in several respects, including the deletion of wing slots and the installation of deicer boots. The Royal Air Force acquired six of the seven YB-24s, including this example. *Stan Piet collection*

Liberator large-scale production commenced in earnest with the B-24D model, with 2,738 built at three plants: Consolidated in San Diego and Fort Worth, and Douglas's Tulsa factory. The B-24D model was the first combat-ready Liberator, with a Martin dorsal turret, the Consolidated A-6A tail turret, and, eventually, waist guns and a retractable ventral turret. Here, "Joisey Bounce," B-24D-25-CO, serial number 41-24266, of the 330th Bombardment Squadron, 93rd Bombardment Group, 8th Air Force, flies in formation with several other Liberators. *Stan Piet collection*



Displaying large American flags on the nose and fuselage top and an RAF night-camouflage scheme, this is one of nine B-24As that Consolidated built, with serial number 40-2376. These planes were used extensively in the Air Corps Ferrying Command, serving as long-range transports.
Stan Piet collection



Ford entered the Liberator-production ring with the B-24E, built at the company's huge new plant at Willow Run, Michigan, starting in September 1942. Ford also trucked B-24E major assemblies to Fort Worth and Tulsa for final assembly. From the outside, the B-24E resembled the early-production B-24D, as seen here with B-24E-5-FO USAAF, serial number 42-7020.
National Museum of the United States Air Force

CHAPTER 1

B-24G

In the beginning, the B-24G basically was a B-24D that was built by North American Aviation, the fourth manufacturing company to join the Liberator Production pool. North American built the aircraft in Dallas, Texas, at the fifth plant dedicated to turning out the Liberators. The letter suffix to the model number was supposed to indicate which firm had made the component. Accordingly, the B-24D was from Consolidated in San Diego, California; the B-24E was made by Ford at its Willow Run plant in Michigan; and North American in Dallas turned out the B-24G. The aircraft from the three producers all were supposed to be similar externally, with the Consolidated planes being the only ones equipped with ball turrets.

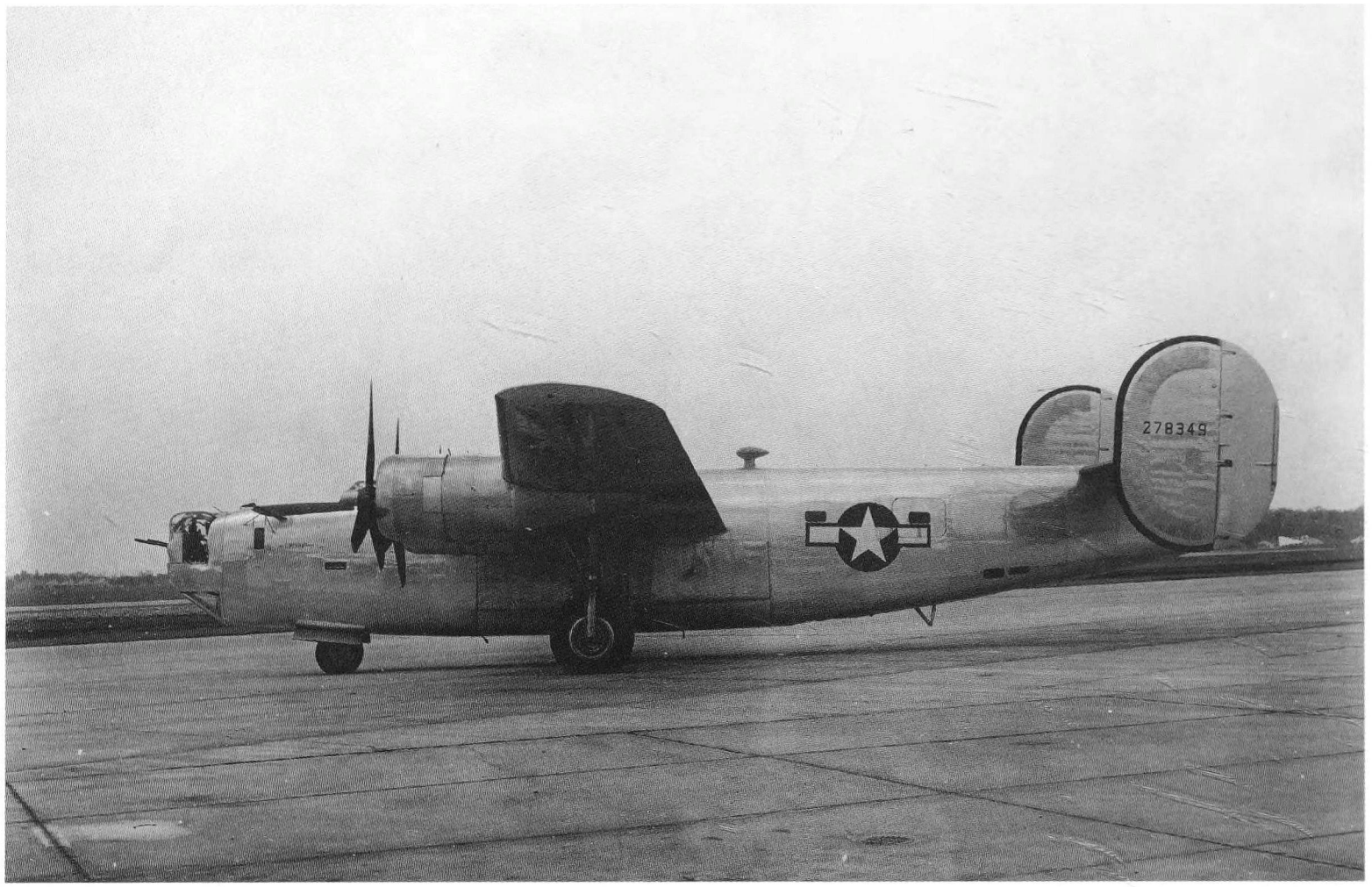
North American turned out twenty-five of the cookie-cutter B-24Gs, but with the twenty-sixth Dallas-built Liberator, a change was made. Emerson power-operated nose turrets began to be installed, just as Ford was doing with its B-24Hs in Michigan.

To keep track of the new aircraft, which were different from the earlier glass-nosed B-24G-NTs, not a new model number but a whole new production block was designated—the B-24G-1-NT—for North American's Liberators with the nose turret.

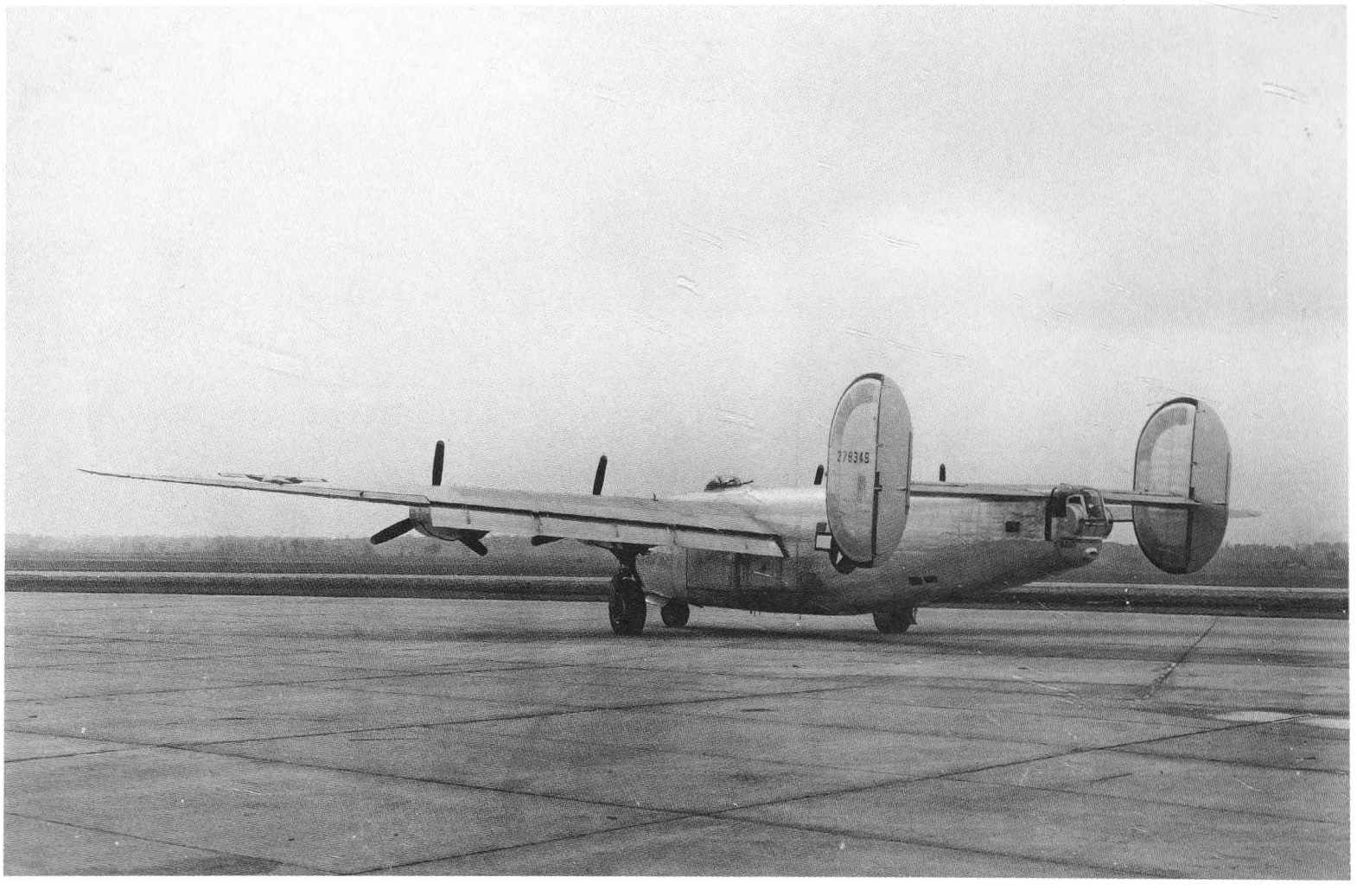
The changes did not stop there, however. Initially the B-24G nose-gear doors opened upward into the wheel well. Beginning with the ball-turret-equipped B-24G-10-NT, however, nose-gear doors opened in the conventional way—outward.

Meanwhile, powerful Buick R-1830-65 Twin Wasp engines replaced the less formidable Pratt & Whitney R-1830-43 power plants. By the time North American's Dallas facility switched to production of the B-24J in June 1944, 430 B-24Gs had rolled off that North Texas assembly line and into service with the US military, particularly the 15th Air Force, which flew the aircraft in the Mediterranean theater.

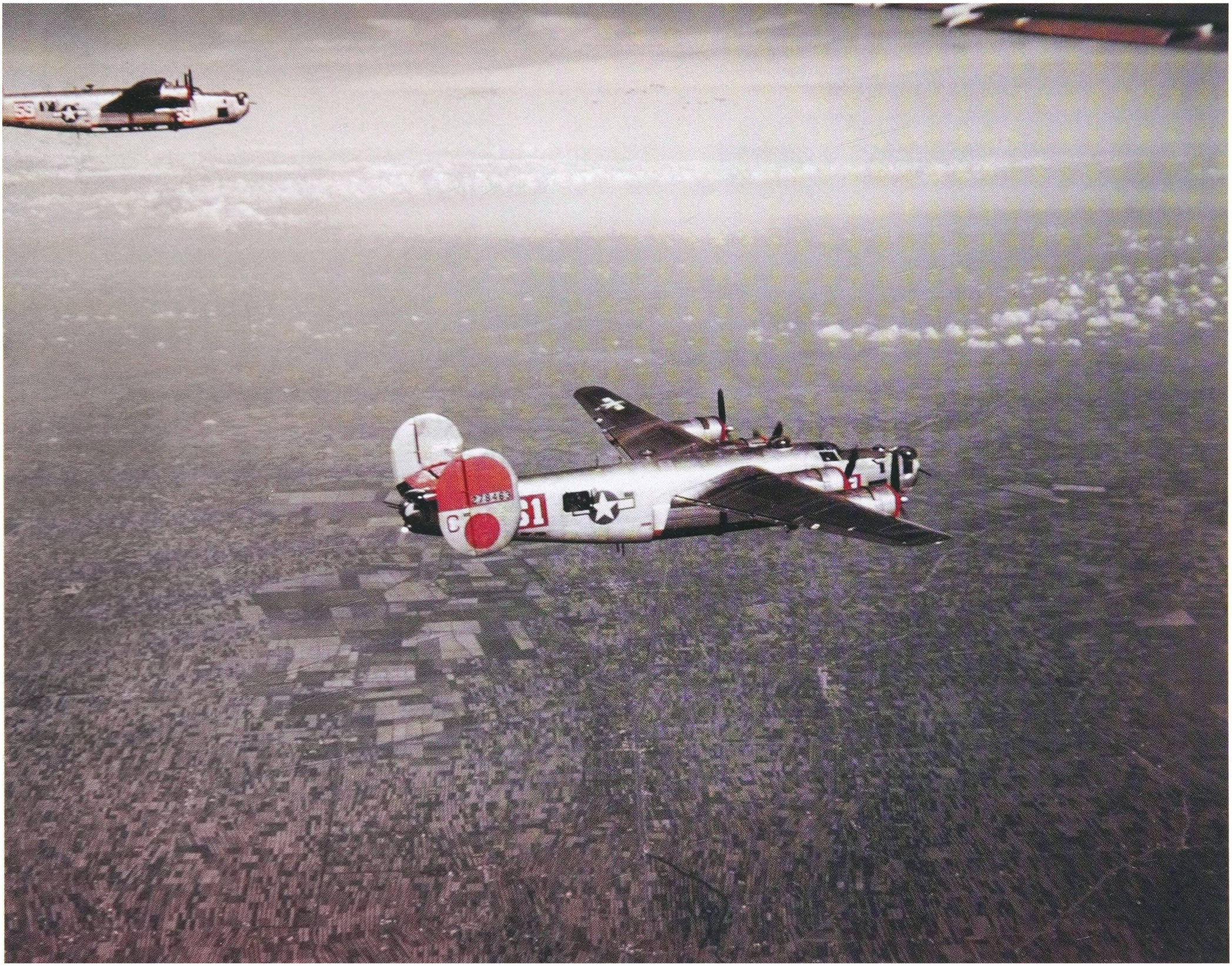
The B-24G model was manufactured by North American at Dallas, Texas. The first production block, the B-24G-NT, was similar to the early B-24D. Starting with the twenty-sixth plane, Emerson nose turrets were installed, as seen here, with the first production block with this addition designated the B-25G-1-NT. Later, with the B-25G-10-NT, a retractable ball turret was introduced. *National Museum of the United States Air Force*



This late-G-model Liberator, B-24G-15-NT, serial number 42-78349, displays the characteristics of the type. Two small scanning windows are present aft of the retractable tail skid, even though the tunnel gun they were to serve has been discontinued, replaced instead with a retractable Sperry ball turret. Faintly visible are thin braces that were added to the pitot-tube mast, mounted just above the cheek window. *National Museum of the United States Air Force*



B-24G-15-NT, serial number 42-78349, was equipped with an MPC (Motor Products Corporation) A-6B tail turret, which had symmetrical guns and a slightly curved sighting window. The Plexiglas side panels of the A-6B extended farther downward than on the previously used A-6A turrets, providing the gunner better sideward visibility. The A-6B turret began being used with the B-24G-5-NT production block. *National Museum of the United States Air Force*



One of the last of the 430 G-series Liberators built, B-24G-16-NT, serial number 42-78463, of the 725th Bomb Squadron, 451st Bombardment Group, is shown here. The red circle on the tail is the marking of the 451st Bombardment Group, while the red upper portion of the vertical stabilizer was indicative of the 49th Bomb Wing. *National Archives*

CHAPTER 2

B-24H

The first B-24H was completed on June 30, 1943. This aircraft was produced at the Ford Willow Run plant and represented a significant improvement in the Liberator. This was the first of the type to have a nose turret installed on the production line (the nose-turret-equipped version of the alphabetically earlier B-24G did not enter production until November 1943). The B-24H was equipped with the electrically operated Emerson Type A-15 nose turret. The bombardier's chin on the B-24H was redesigned so that it did not have the drop that was characteristic of the earlier turret additions performed by the Oklahoma City modification center. Later in B-24H production, the Martin A-3D "high hat" top turret replaced the earlier models, and waist machine gun positions were enclosed. These nearly complete B-24H-20-FOs are in the final stages of production at Ford's Willow Run plant. The oblong opening visible aft of the top turret of the Liberator in the foreground was the life raft compartment. There was one of these on each side of every B-24H. The last two digits of the aircraft serial numbers have been stenciled on the noses of the bombers. *National Archives*

Though often well defended in other parameters, most World War II bombers were highly vulnerable when attacked from straight ahead. As a result, everyone from engineers to field personnel worked hard to devise ways to improve the B-24's forward defenses. One innovation that proved highly effective was the installation in the field of a Consolidated A-6 tail turret in the B-24D's nose. So successful was this field modification that the US Army ordered that all Liberators bound for the Pacific theater be fitted with such nose turrets. When equipped with turrets at air depots, B-24s were transformed into B-24D1 bombers. Although the change necessitated a total redesign of the aircraft's nose and bombardier's station, factories soon began installing similar upgrades, producing the B-24H, a Ford-built Liberator with an Emerson A-15 turret.

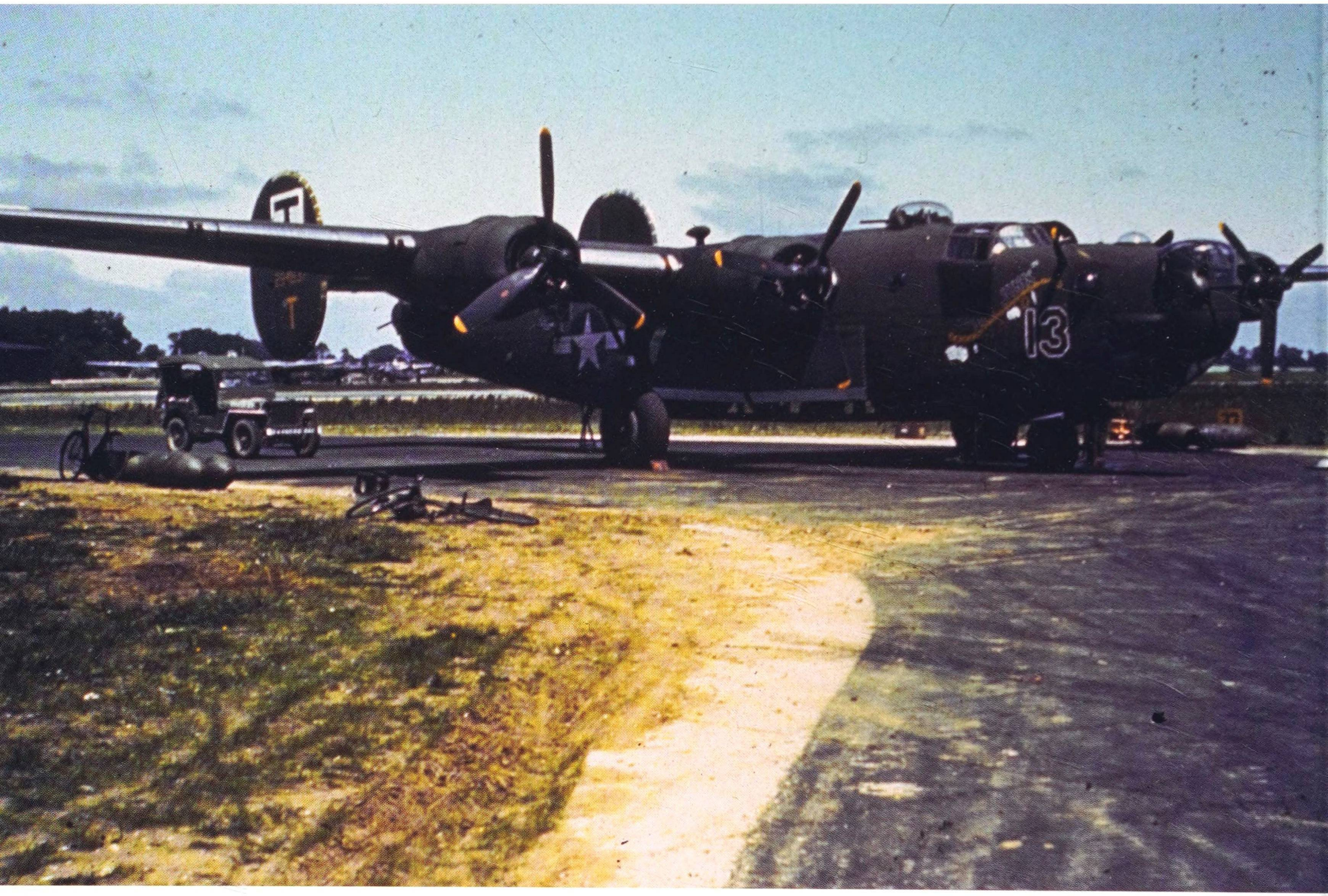
The Martin A-3C was the first top turret used on the B-24H, but later-production B-24H aircraft incorporated the Martin A-3D. The A-3D's enclosure was larger and taller, affording the gunner a greater field of vision. Similarly, the Consolidated A-6B tail turret, which was fitted to all B-24H bombers, also improved the field of vision for tail gunners.

Another feature of the B-24H that saw upgrades and improvement was the navigation lights. Initially the tops and bottoms of B-24H wingtips had separate lights. Later-production versions, however, featured navigation lights at the very end of each wingtip.

Engines, too, saw development as B-24H production progressed. Four R-1830-43 power plants drove the B-24H-1-CF, B-24H-1-FO, and B-24H-DT, and all Douglas-built B-24H bombers from beginning to end used the R-1830-43. Consolidated and Ford, however, built the more powerful R-1830-65 engine into their later production blocks of the B-24H.

Total output of the aircraft was impressive: the production facilities in Michigan, Oklahoma, and Texas, pumped out a massive total of 3,100 B-24H Liberators.

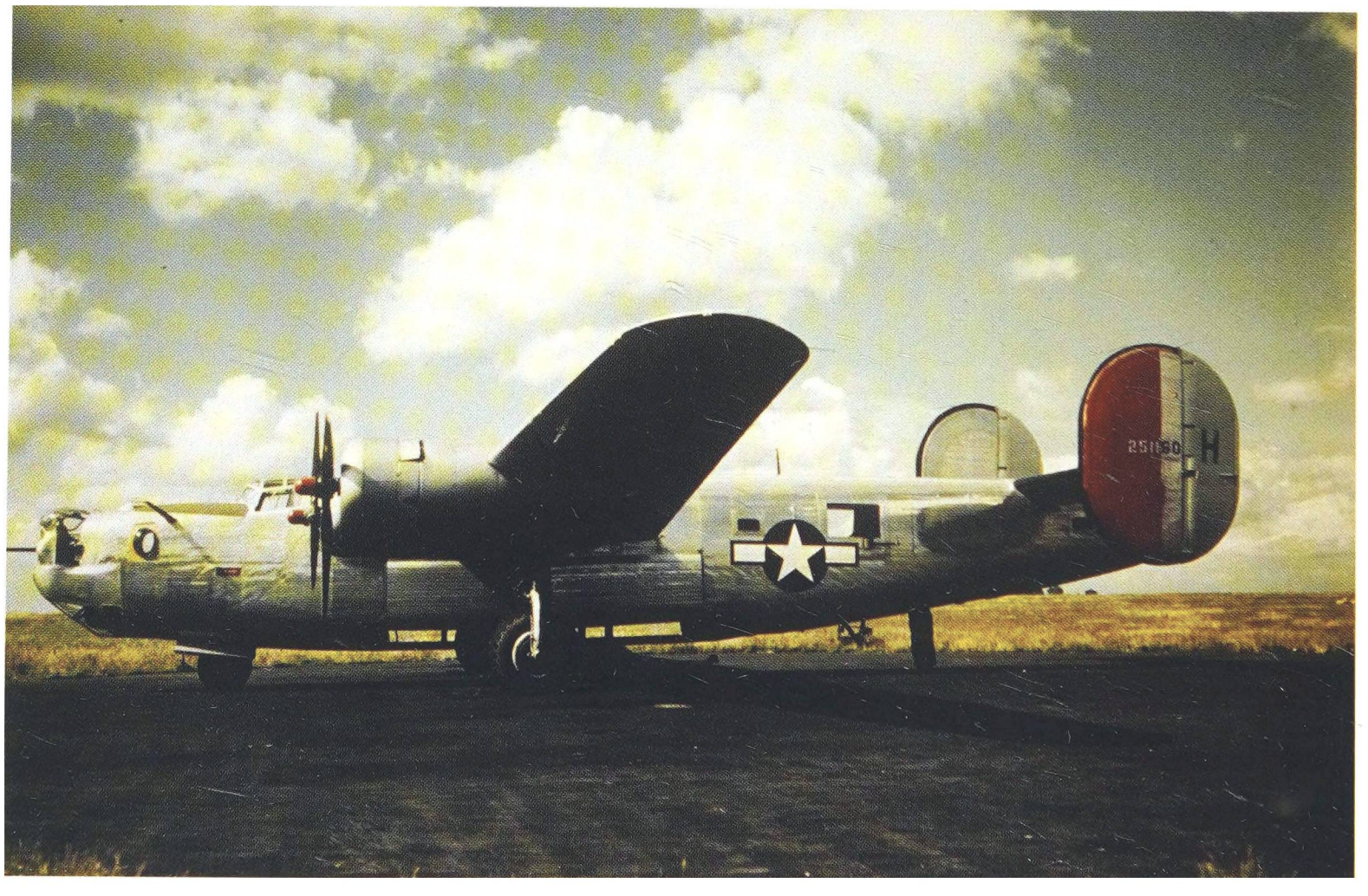
In addition to building flyaway aircraft, Ford's massive Willow Run plant produced knockdown bomber kits. These kits were shipped from Michigan to the final-assembly plants in Texas or Oklahoma by freight cars or by a fleet of almost ninety specially built trucks with 63-foot trailers. On the basis of the complete B-24H aircraft in the background, this particular knockdown Liberator is probably a B-24H as well.
From the collections of the Henry Ford



This B-24H-20-FO, serial number 42-94837, was first attached to the 848th Bomb Squadron, 490th Bombardment Group, 8th Air Force. The aircraft was then transferred to the Mediterranean theater in December 1944. Dubbed "the Jinx," the aircraft was adorned with a painted bracelet chain with various charms, such as a pair of dice, an eight ball, a four-leaf clover, and a white elephant.
US Air Force Academy Library

In the foreground of this view inside Consolidated Aircraft's Fort Worth plant is B-24H-25-CF, serial number 42-50395. Behind 42-50395 are RAF-bound Liberators, either Mk VI or Mk VIII, mixed with US aircraft along the assembly line. The assembly line at left is building C-87-CF Liberator Expresses, with 44-39214 to the far left. *National Museum of the United States Air Force*

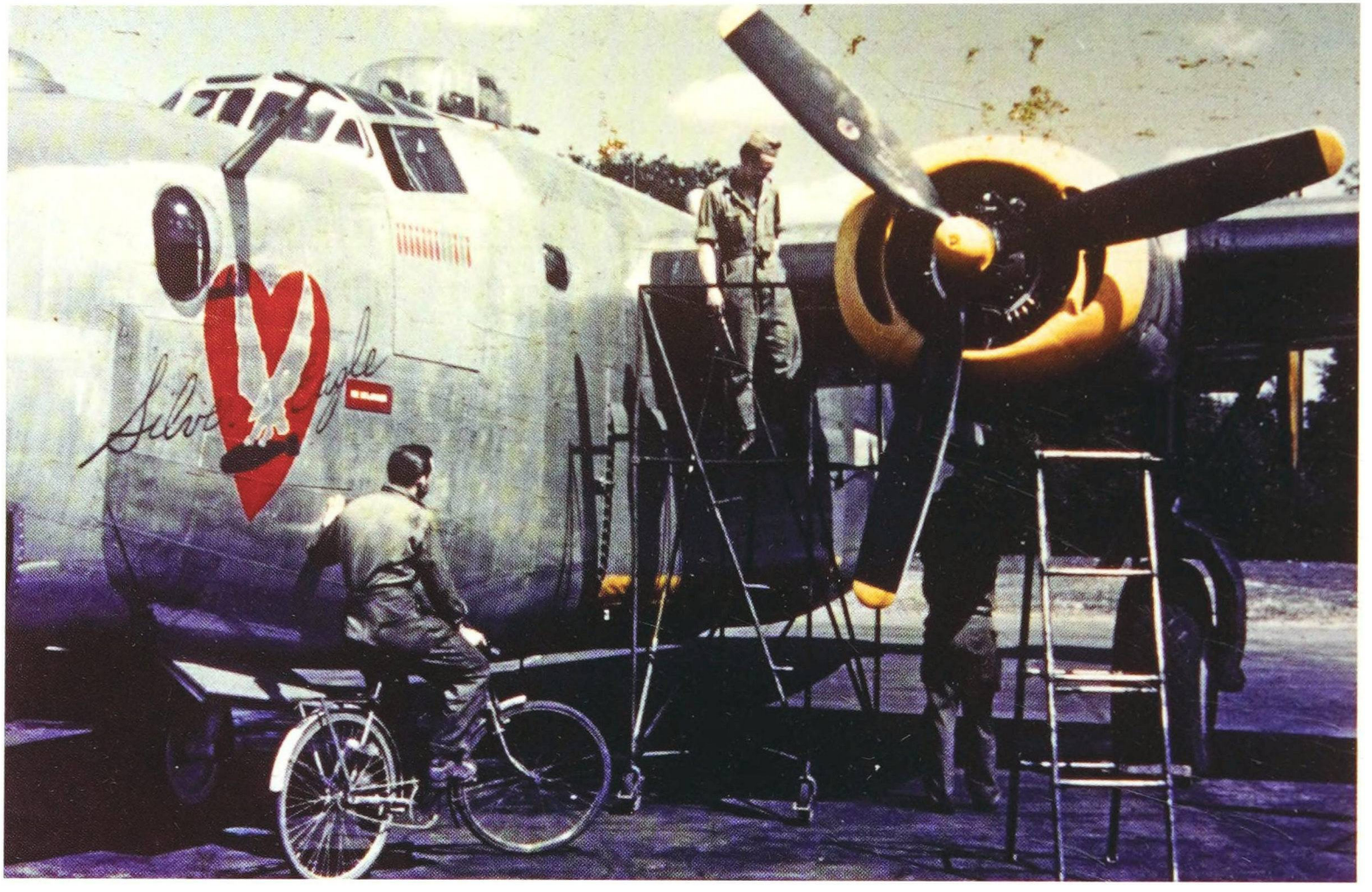
"Ann," B-24-H-30-DT, serial number 42-51190, from the 18th Bombardment Squadron, 34th Bombardment Group, 8th Air Force, is warming its engines at RAF Mount Farm, England. Built by Douglas Aircraft, Tulsa, and nicknamed "Ann," this Liberator collided with B-24H-20-FO, serial number 42-94893, "Hell's Belle," over Friedrichsthal, Germany, on July 19, 1944, resulting in the deaths of eleven crewmen. *Roger Freeman collection*



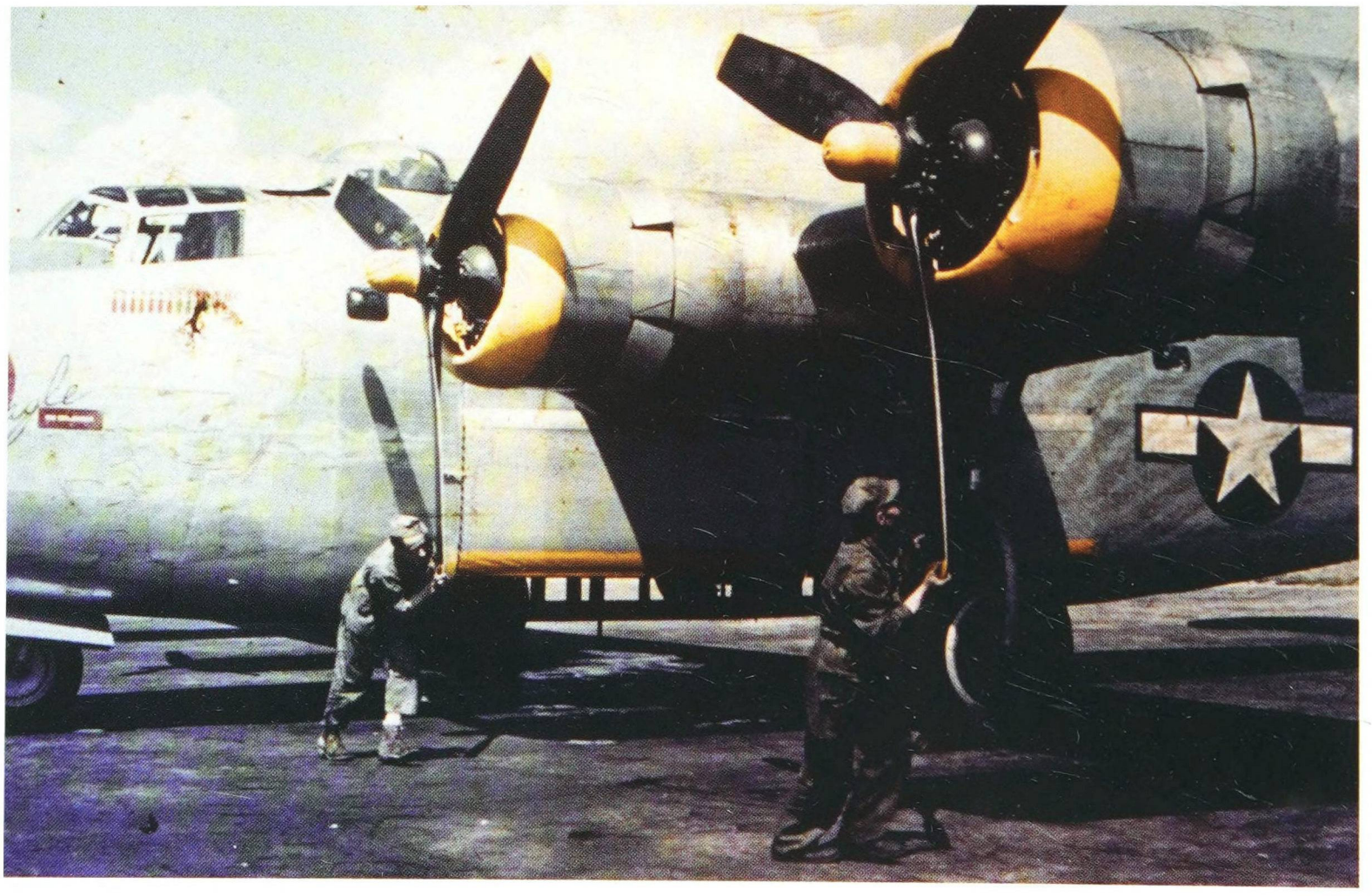
The left side of "Ann," B-24H-30-DT, serial number 42-51190, is viewed in this undated photograph at RAF Mount Farm. The navigator's bubble windows on each side of the nose are mounted on rectangular plates that are yellowish in color. *Roger Freeman collection*

Consolidated B-24H-30-CF, serial number 42-50427 and code WQ-V, nicknamed "Puritanical Witch," from the 68th Bombardment Squadron, 44th Bombardment Group, is seen after crashing on takeoff at RAF Shipdham on March 22, 1945. This would have been the plane's seventy-ninth mission. The fuselage from the cockpit forward was wrenched away from the remainder of the fuselage.
Roger Freeman collection

"Puritanical Witch" of the 44th Bombardment Group is viewed from another angle after its catastrophic takeoff accident at Shipdham. Firefighting foam covers the wreckage. This Liberator formerly had been nicknamed "Puritanical Bitch," but an Army censor reportedly insisted on a different name.
Roger Freeman collection

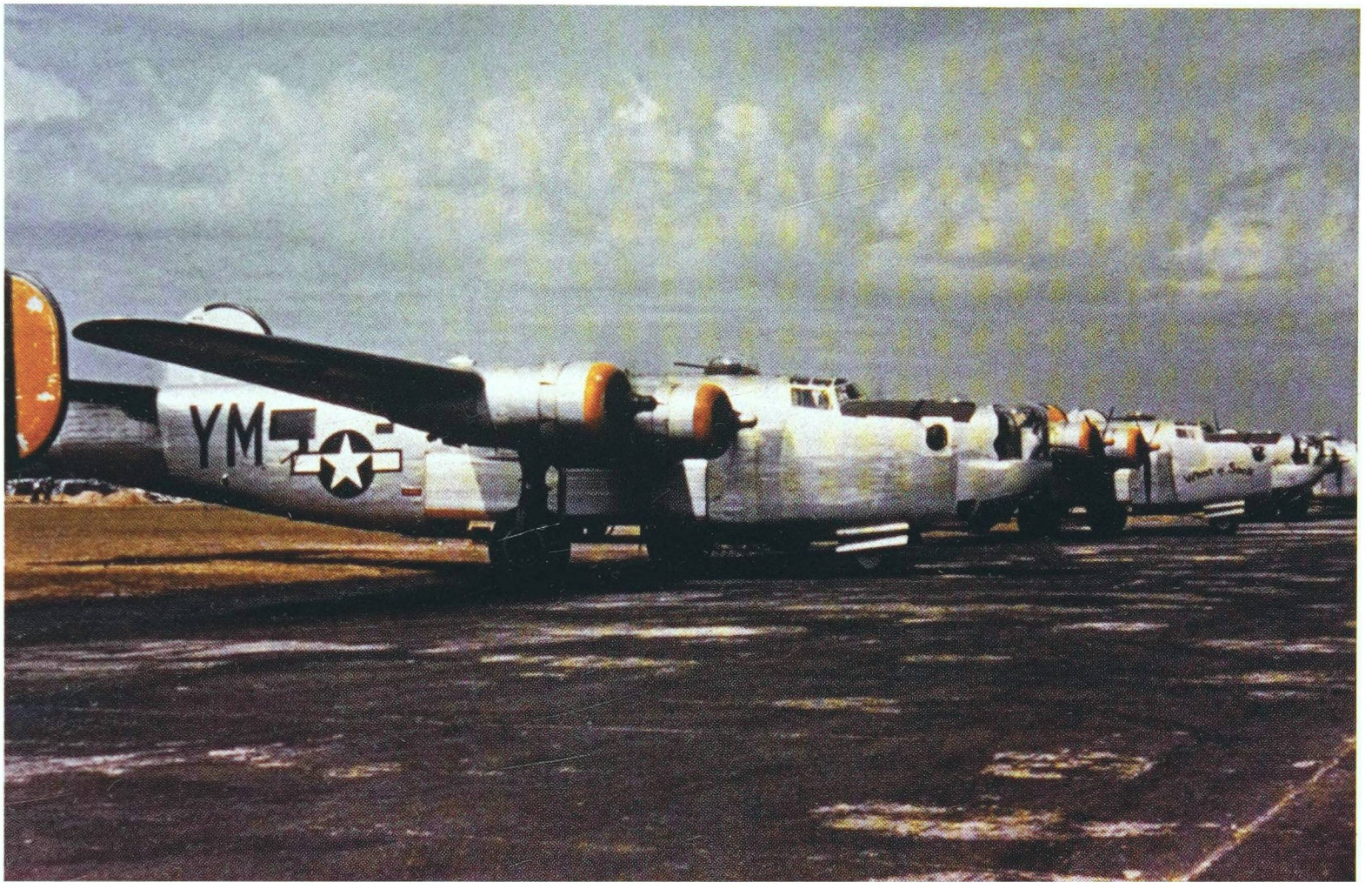


Ground personnel of the 93rd Bombardment Group are preparing "Silver Eagle," B-24H-25-CF, serial number 42-50362, for its next combat mission. Note the bubble window for the navigator and the scoreboard on the pilot's armor plate below the cockpit canopy, with stencils of bombs representing twelve missions. *Roger Freeman collection*



Two ground crewmen from the 93rd Bombardment Group are spinning the two left propellers of "Silver Eagle," B-24H-25-CF, serial number 42-50362, prior to the starting of the engines. The bomb bay doors are open, permitting a view of the truss-type frame running along the bottom of the bay. *Roger Freeman collection*

In an undated photograph, B-24 Liberators of the 93rd Bombardment Group, including, second from left, "What a Sack," B-24H-25-FO, serial number 42-95258, are parked on a flight line at an unidentified base. The first plane bears the YM squadron code of the 409th Bombardment Squadron and has the "notched" antiglare panel characteristic of Ford-built Liberators, to the front of the cockpit windscreen.
Roger Freeman collection



Despite having its hydraulic system shot up while bombing the Peine marshaling yards, B-24H-25-DT, nicknamed "Pegasus the Flying Red Horse," serial number 42-51141, made it back to its base at Attlebridge, England. Crew members secured two of their parachutes to the waist gun positions in order to slow the aircraft, which lacked a working brake system. "Pegasus" was assigned to the 784th Bomb Squadron, 466th Bombardment Group, 8th Air Force.
National Archives

CHAPTER 3

Liberator VI

The British were supplied many B-24s, which were employed in a number of ways. The Commonwealth did not use the letter suffix (D, L, etc.) designations used by the US, but instead used Roman numerals, which did not correspond to the American models. These two Liberator Mk VI aircraft were photographed at Ford's Willow Run plant. The Liberator Mk VI designation, however, also applied to some B-24G and B-24J aircraft. *National Archives*

The Royal Air Force (RAF) acquired some former USAAF B-24H aircraft, classifying them as Liberator Mk VI, the same designation that was given to a large number of B-24J aircraft as well as some B-24G models. Confusing things even more, other B-24Js delivered to the RAF were designated Liberator Mk VIII—the Mk VII designation having been applied to C-87 Liberator Express aircraft. Also classified as Liberator Mk VIII were some B-24L aircraft.

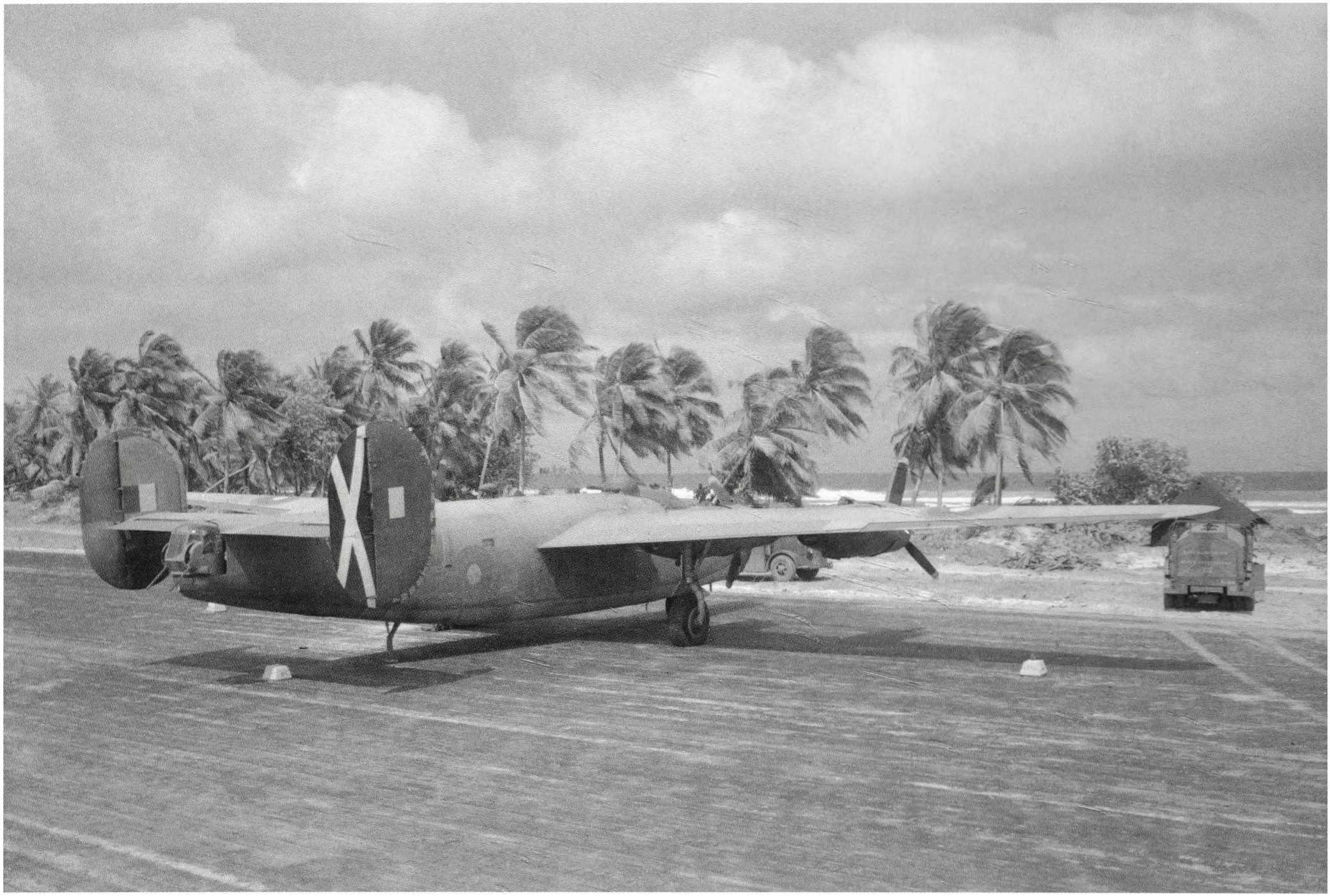
Among the Liberator Mk VI aircraft were all the 739 San Diego–built B-24Js and the first 500 Fort Worth–assembled B-24Js. Typically, the J-equivalent Liberator Mk VI had a Consolidated nose turret, while the G- and H-equivalent Mk VI bombers had Emerson nose turrets.

The Liberator Mk VIs were further designated with a letter prefix indicating use and equipment. These designations were "B" for bomber, "C" for cargo, and "GR" for long-range maritime patrol. For example, the Liberator GR Mk VI was a long-range patrol aircraft.

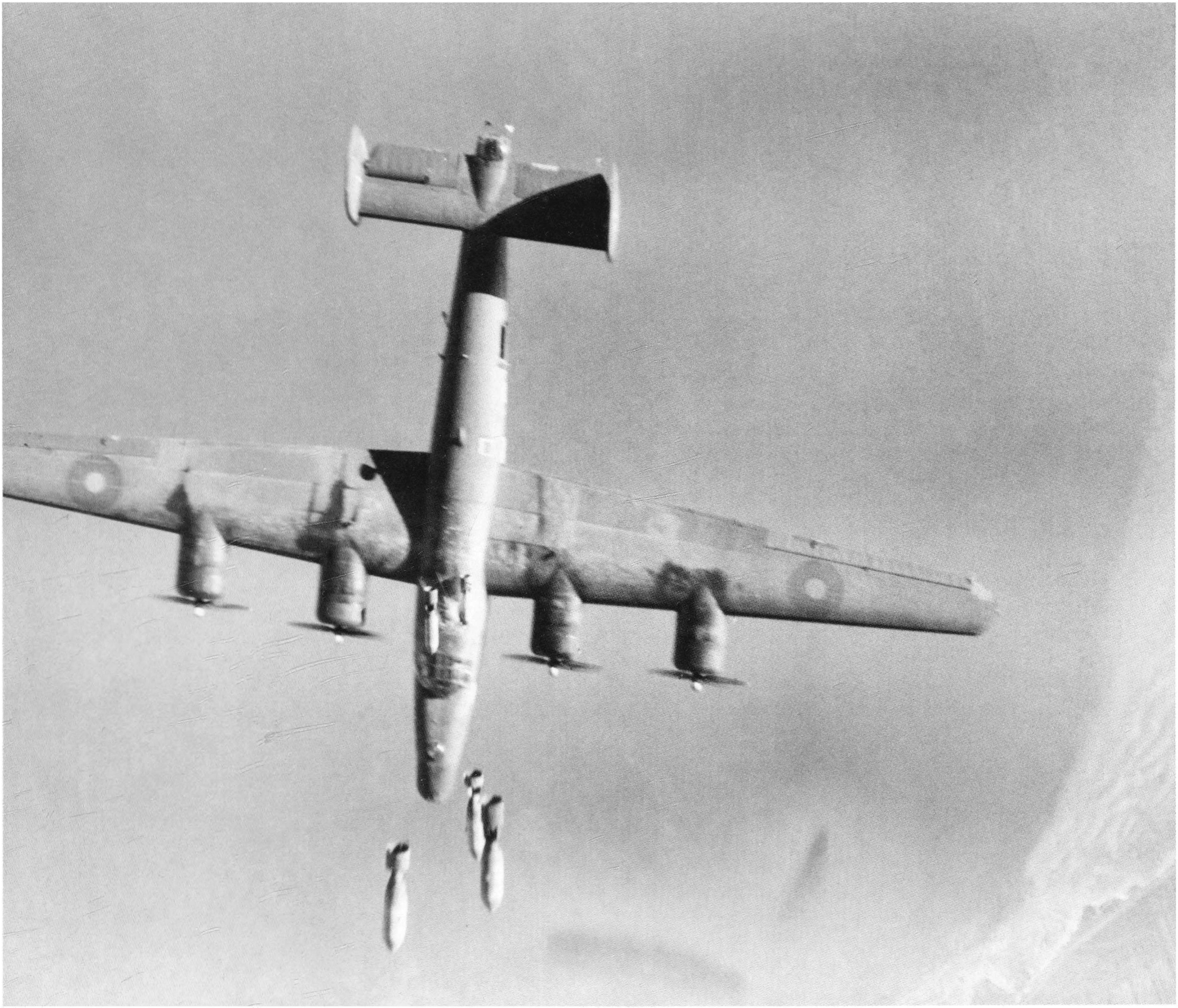
The Liberator Mk VI began to arrive in England during the first half of 1944. Some were assigned to RAF Bomber Command, who used the aircraft in the China-Burma-India and Mediterranean theaters, feeling it not suitable for use over Europe. In Burma, some were used at night, but in both theaters the aircraft were flown primarily in the day.

Coastal Command was assigned many of the aircraft, with the type serving with over a dozen squadrons, who used them both for antisubmarine patrols as well as long-range antishipping bombers.

On an airfield on Brown's West Island, the largest of the Cocos Islands, Liberator B Mk VI, serial number KL654, of No. 356 Squadron, RAF, is being prepared for a mission on July 27, 1945. One week after this photo was taken, the bomber and its crew were lost while performing a special-duties flight over Thailand. *Imperial War Museum*



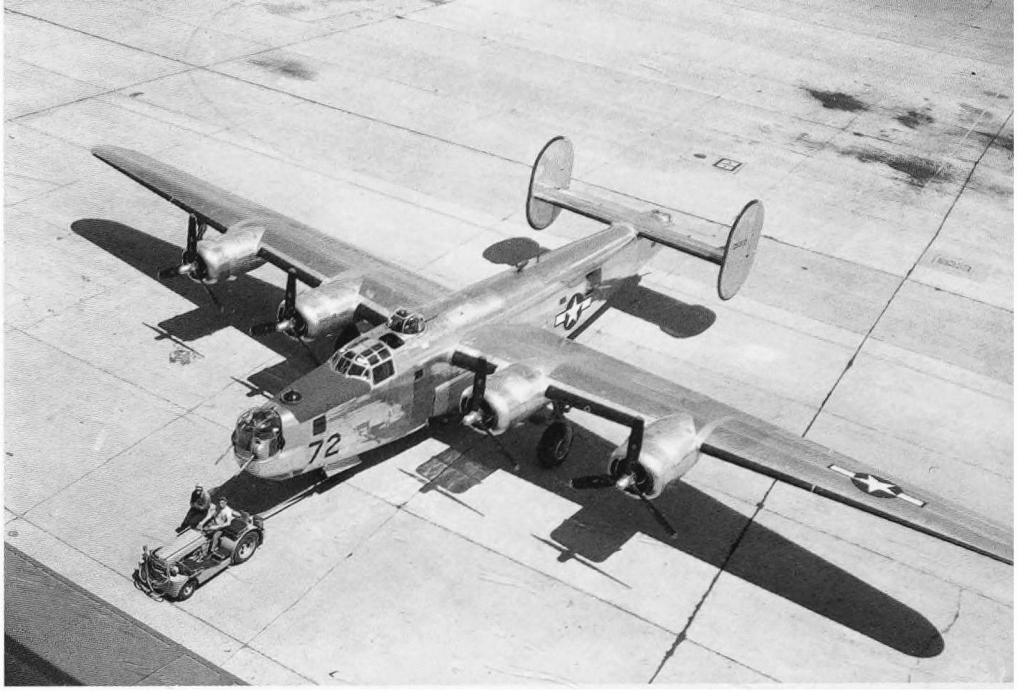
Liberator B Mk VI long-range bombers of No. 356 Squadron, RAF, as well as Liberator GR Mk VI coastal patrol aircraft, operated from this base at Brown's West Island, Cocos Islands, in the summer of 1945. This island is located between the northwest coast of Australia and Sumatra. *Imperial War Museum*



This shocking image captures a stick of 1,000-pound bombs raining down on Liberator B Mk VI KK320 of No. 37 Squadron, RAF. The squadron was attacking shipyards in Monfalcone, Italy, in March 1945, and apparently one of the Liberators got out of the assigned position during the formation's bomb run. Remarkably, the Liberator, although losing a propeller and suffering a large hole in the fuselage, was able to return her eight crew members safely to base. The aircraft, however, was damaged beyond repair. *Imperial War Museum*

CHAPTER 4

B-24J



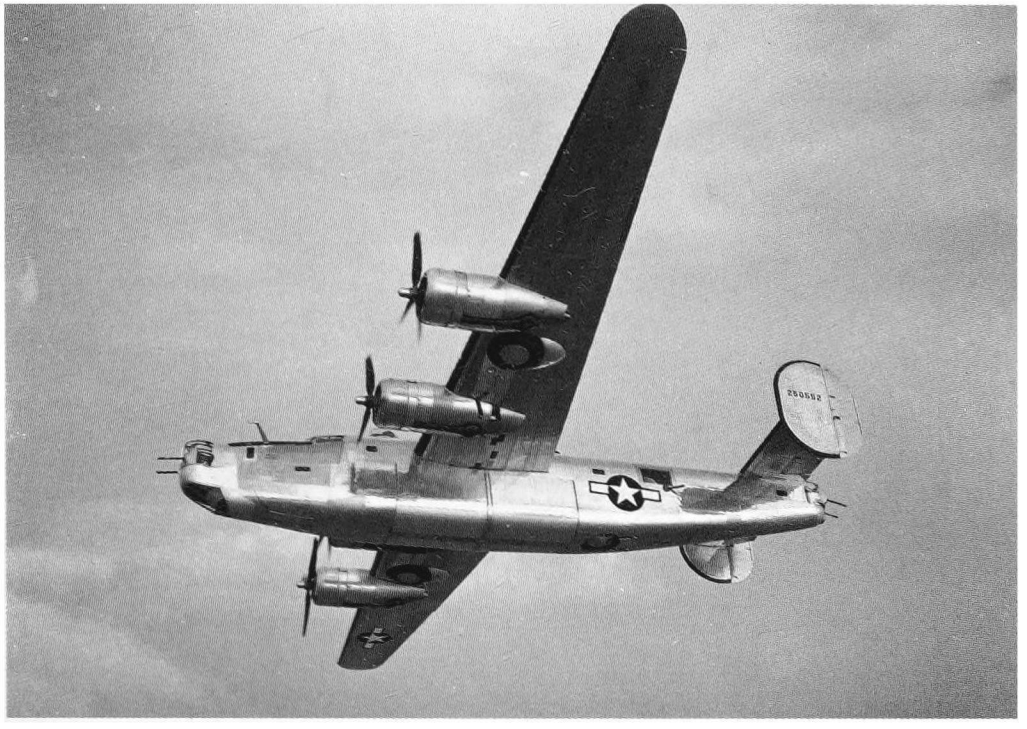
The B-24 remains the most produced heavy bomber in history, and the B-24J, of which 6,678 were built, is the most produced variant of the aircraft. It is the only model that was produced by all five plants. Here, an aircraft tug pulls a brand-new B-24J-15-FO out of Willow Run. This particular bomber features an Emerson nose turret. The aircraft lacks the distinctive mast-mounted pitot tubes characteristic of many B-24Js, instead featuring a small, single pitot tube on the lower left side of the forward fuselage. Like all Ford B-24Js, this bomber has outward-opening nose-gear doors, visible just beneath the nose number. *National Archives*

If B-24H production was impressive, output of the B-24J was astounding—the largest output of any model of the Liberator, chiefly because all five production pool factories turned it out. A total of 6,678 B-24Js rolled off the various assembly lines across the country.

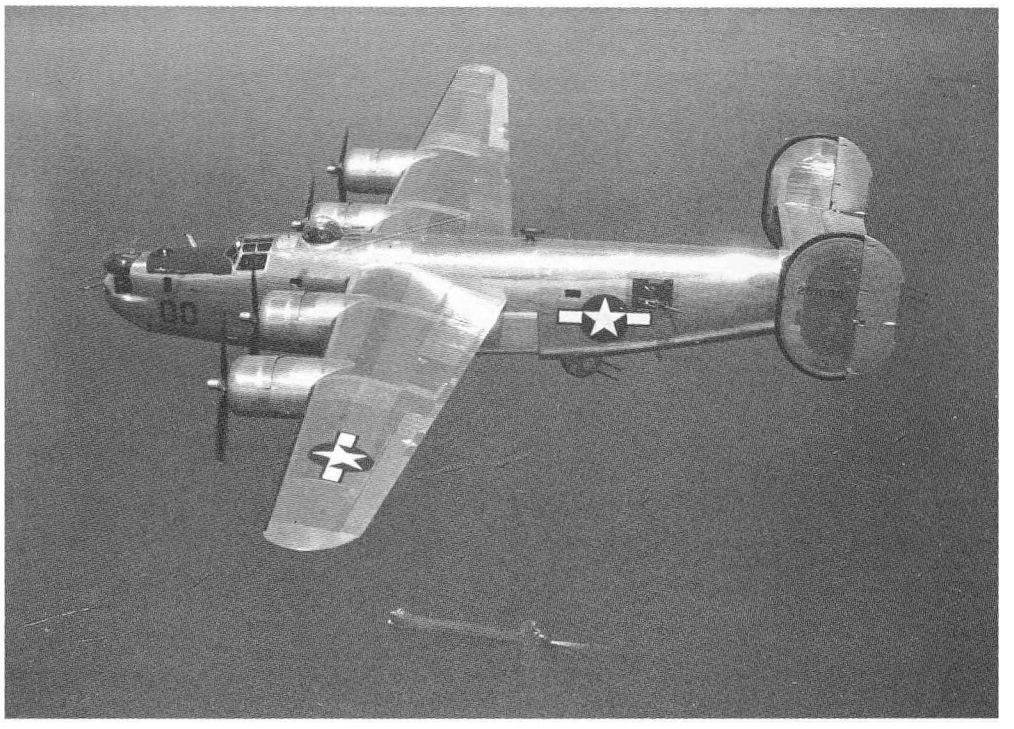
Initially, the J-model designation was intended for the Consolidated Liberators that featured nose turrets. On March 17, 1943, Consolidated Aircraft and Vultee Aircraft merged to form Convair, and accordingly the B-24J first went into production in San Diego at the now Convair facility in August 1943. In September, the Convair plant in Fort Worth, Texas, also took up production of the B-24J while simultaneously continuing to turn out B-24H bombers from kits delivered by Ford until May 2, 1944. Other plants were originally expected to continue making the B-24G and H. In early 1944, however, the Army stepped in to mandate more changes in the Liberator, obliging all five production facilities to turn out the same B-24J model. Ford shifted its production to the B-24J in April, and Douglas and North American followed suit in May.

Thus, by the middle of 1944, all five production facilities were working concertedly to produce the same B-24J model. Nevertheless, B-24Js still exhibited certain traits that were unique to different manufacturers. Waist gun positions were particularly varied. Initially these positions were enclosed and staggered on all B-24Js other than those made in San Diego. The staggering of the positions was not accomplished by relocating the waist gun windows, as would later be done on the B-17G, but by moving the gun mounts. The K-6 mount was positioned in the lower rear corner of the left-hand waist gun position, and in the lower front corner of the right-hand gunner's location. Late in the production run, this staggering of the waist gun positions was also adopted by San Diego.

Yet another unique feature of San Diego–built B-24J bombers is the fact that in most cases, their nose-gear doors opened inward, while these doors opened outward on B-24J aircraft produced elsewhere.



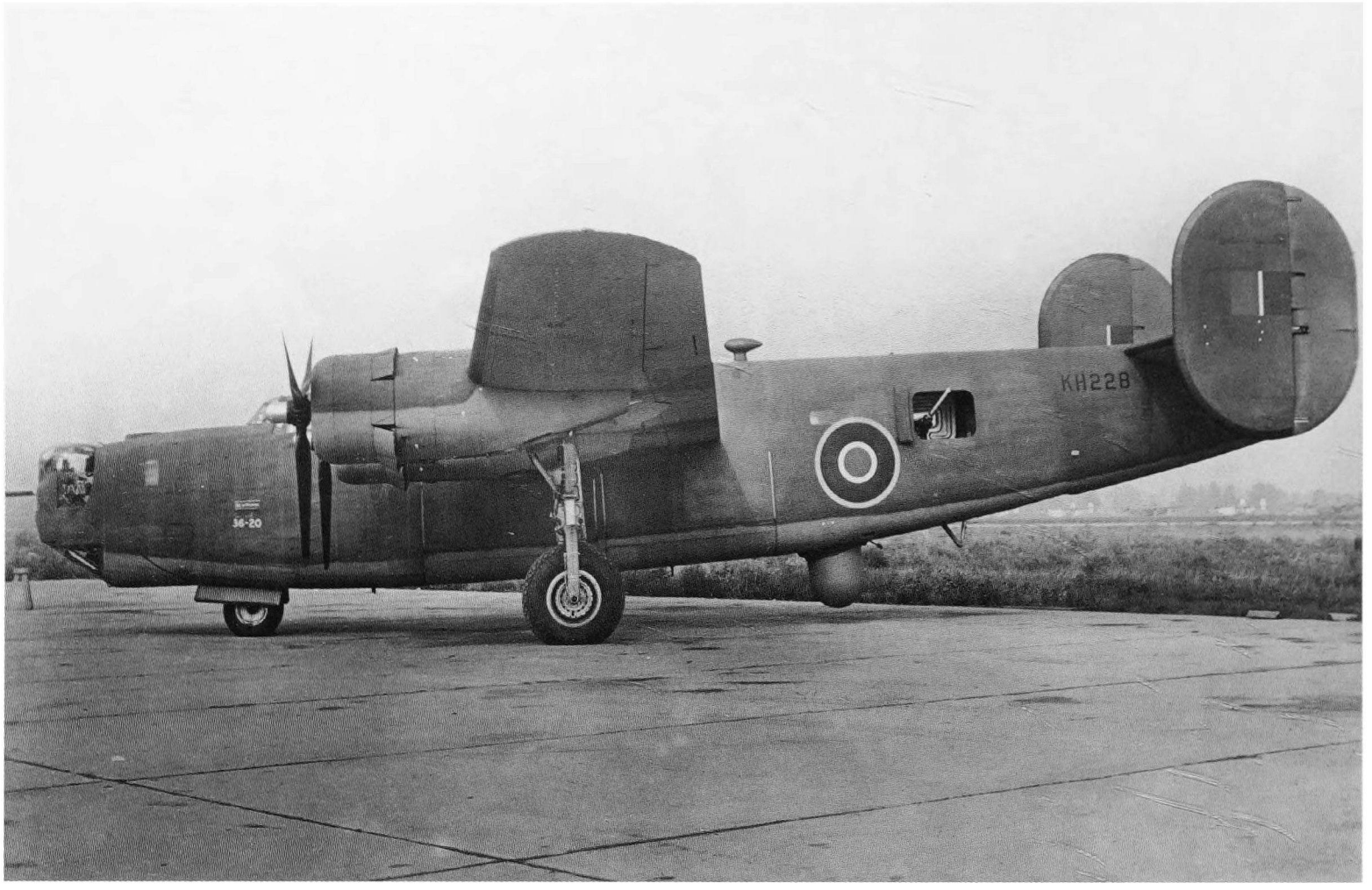
The ball turret of B-24J-1-FO, serial number 42-50552, is retracted, with recessed-in troughs in the bottom of the aircraft accepting the machine gun barrels. Except for the initial B-24Js produced in San Diego, all B-24s had staggered waist gun mounts. The port gun, visible here, was mounted at the rear of the window, while the gun on the other side was mounted at the front of the window. *National Archives*



An example of a Ford-manufactured B-24J was USAAF serial number 42-51000, a B-24J-5-FO. The Sperry ball turret is lowered and traversed to the rear. The black deicing boots on the leading edges of the wings, the vertical fins, and the horizontal stabilizers contrast with the shiny aluminum surfaces. Pitot-tube masts jut from the deck to the front of the windshield.

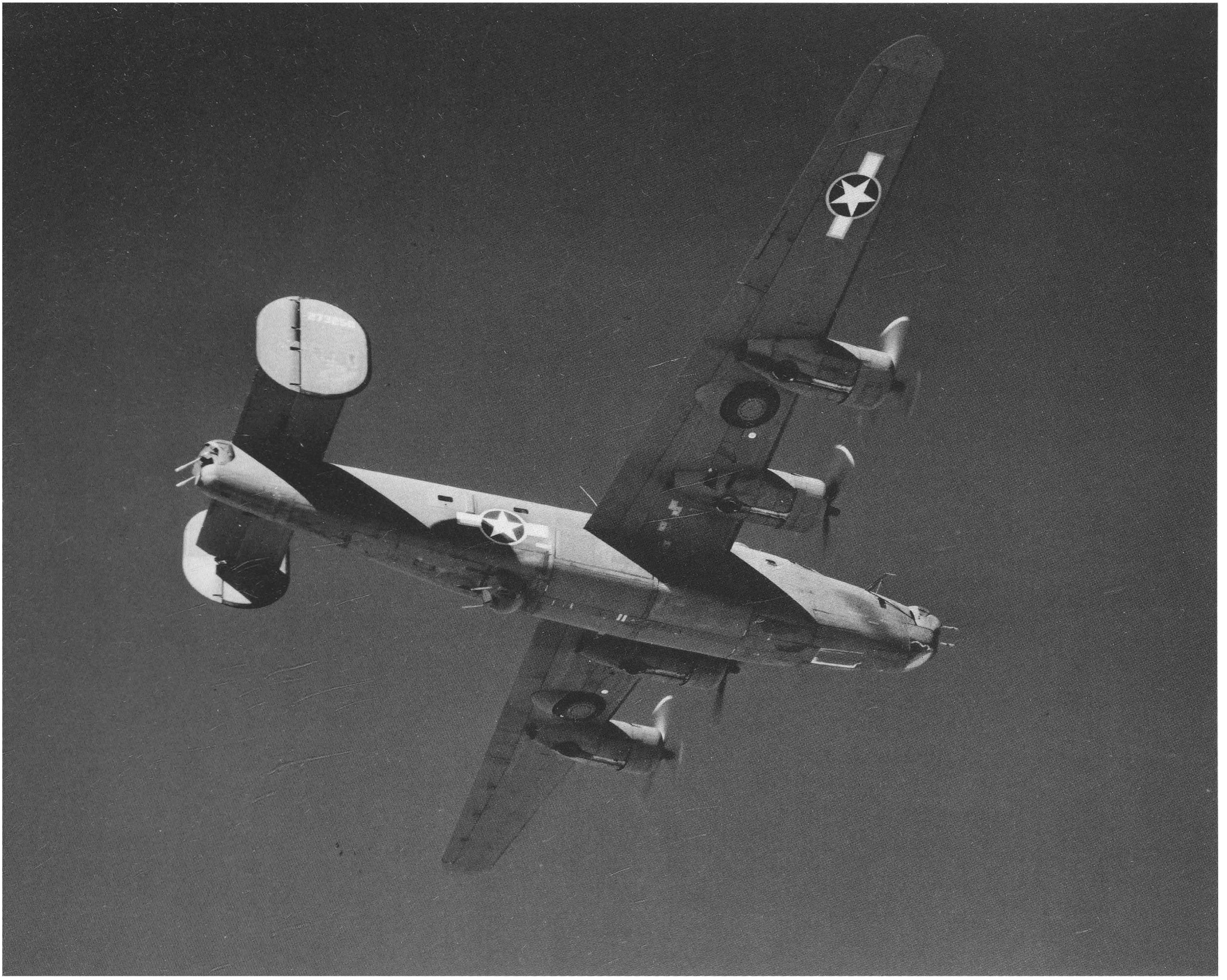
Willow Run–built Liberator B-24J-1-FO, serial number 42-95559, exhibits the ball turret in the lowered, ready-for-use position. While bare-metal bombers were slightly faster, owing to lower weight and a somewhat smoother surface, they were also more visible to enemy gunners and pilots. *National Archives*

A B-24 Liberator is parked at an airfield in the high desert. The aluminum-alloy skin is buffed to a high sheen. The port wing hides the tail number on the vertical fin, precluding a positive identification of the model of this plane. *National Museum of the United States Air Force*



The Royal Air Force designated late-production B-24Js as well as B-24Ls as Liberator Mk VIII. This aircraft, serial number KH228, awaiting delivery to the RAF at the Convair Modification Center, Louisville, Kentucky, in August 1944, was further designated Liberator B Mk VIII ("B" standing for bomber). Protruding from the belly of the aircraft is a radome. The aircraft would be assigned to No. 614 Squadron, RAF, in Italy. *Imperial War Museum*

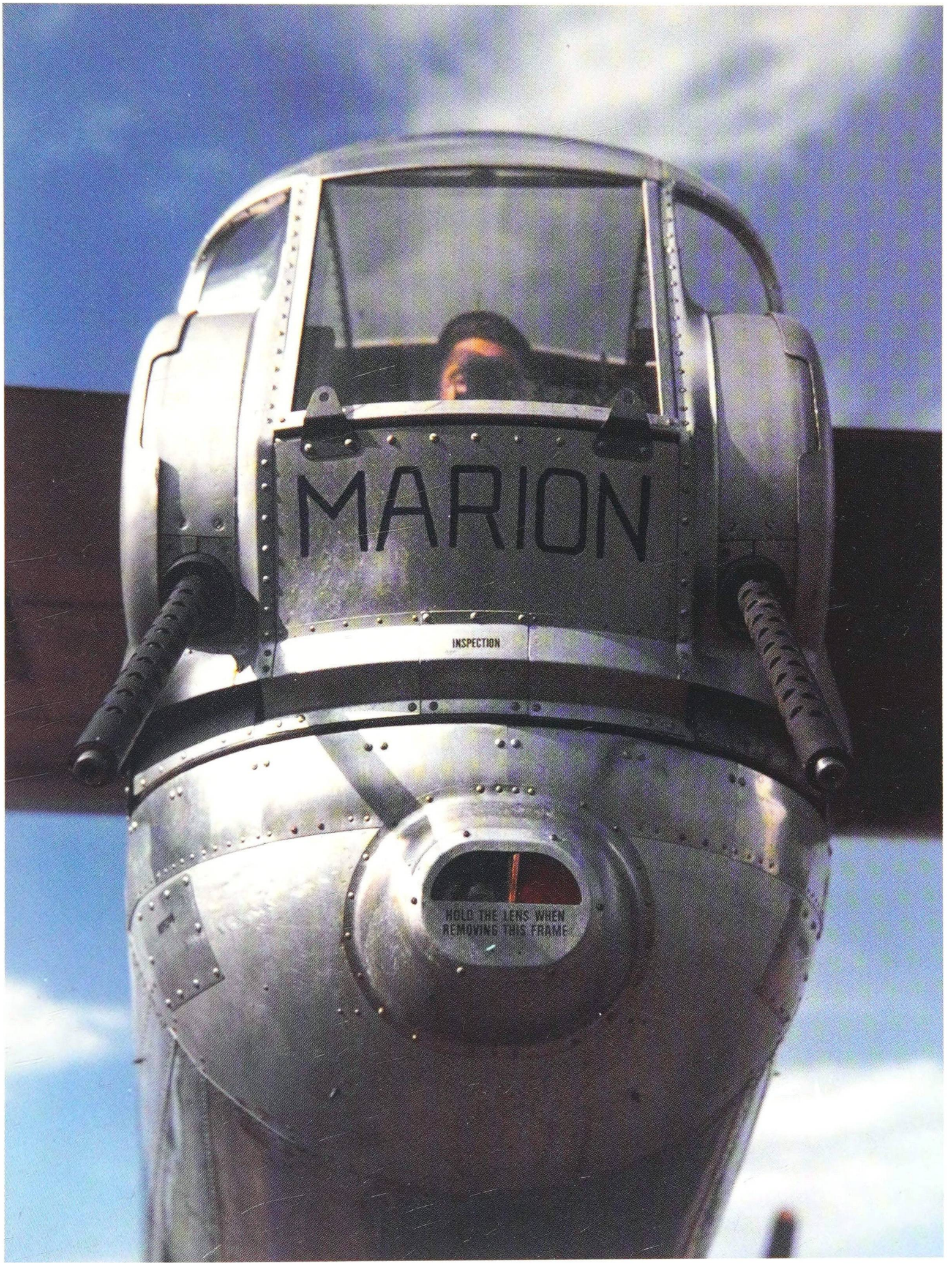
Consolidated B-24J-65-CF, USAAF serial number 44-10560, appears in factory-fresh highly polished aluminum finish. The plane would serve with the 742nd Bombardment Squadron, 455th Bombardment Group, 15th Air Force, under the nickname "What's Cookin' Doc?" *National Museum of the United States Air Force*



Consolidated B-24J-25-CO, USAAF serial number 42-73250, is viewed from below during a mission. This plane, which served with the 425th Bombardment Squadron, 308th Bombardment Group, 14th Air Force, and had the nickname "250," was lost over China on December 10, 1944. *National Museum of the United States Air Force*

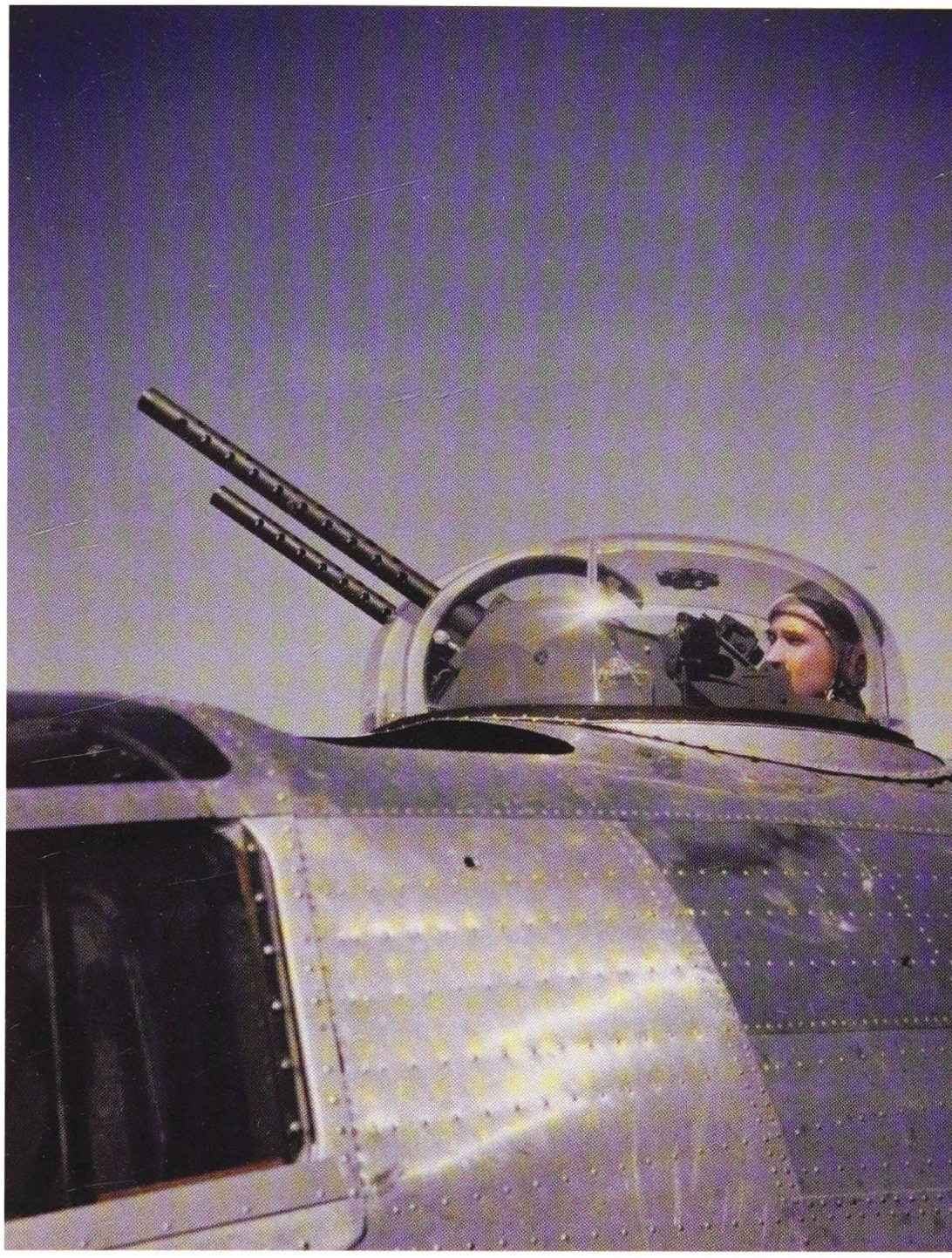
B-24J-1-FO, USAAF serial number 42-50753, was one of the first B-24Js produced by Ford at their Willow Run facility. The aircraft first flew to Connecticut, and then to Europe, completing eighty-seven missions with the 703rd Bombardment Squadron, 445th Bombardment Group, before returning to Albuquerque in May 1945. *Stan Piet collection*

This is a Motor Products Corporation (MPC) A-6B tail turret, distinguishable from the A-6A by its symmetrical guns and slightly curved sighting window. Barely visible is a gunner behind his sight. Below the turret are the bomb-signal lights. *National Archives*



Crew 65 of the 755th Bombardment Squadron, 458th Bombardment Group, 8th Air Force, pose in front of their Liberator. To the front are Lt. William C. Rowland, the copilot (*left*), and Capt. Robert V. Whitlow, the pilot. Between them is Lady, a cocker spaniel mascot, and in the background are other members of the crew. *National Archives*

In addition to the preceding color photo of the crew, a USAAF photographer also took a series of portraits of the members of Crew 65 at their stations in the Liberator. Seen here is copilot Lt. William C. Rowland, a native of New Castle, Pennsylvania. His side window is partially opened; note the bent-metal reinforcing strip near the forward edge of the window. *National Archives*



The top gunner of Crew 65, SSgt. Walter J. Newberry of Batavia, New York, mans the twin .50-caliber machine guns in the Martin turret. This turret was the type with the low-profile Plexiglas dome. The escape hatch immediately to the right front of the turret is open. *National Archives*

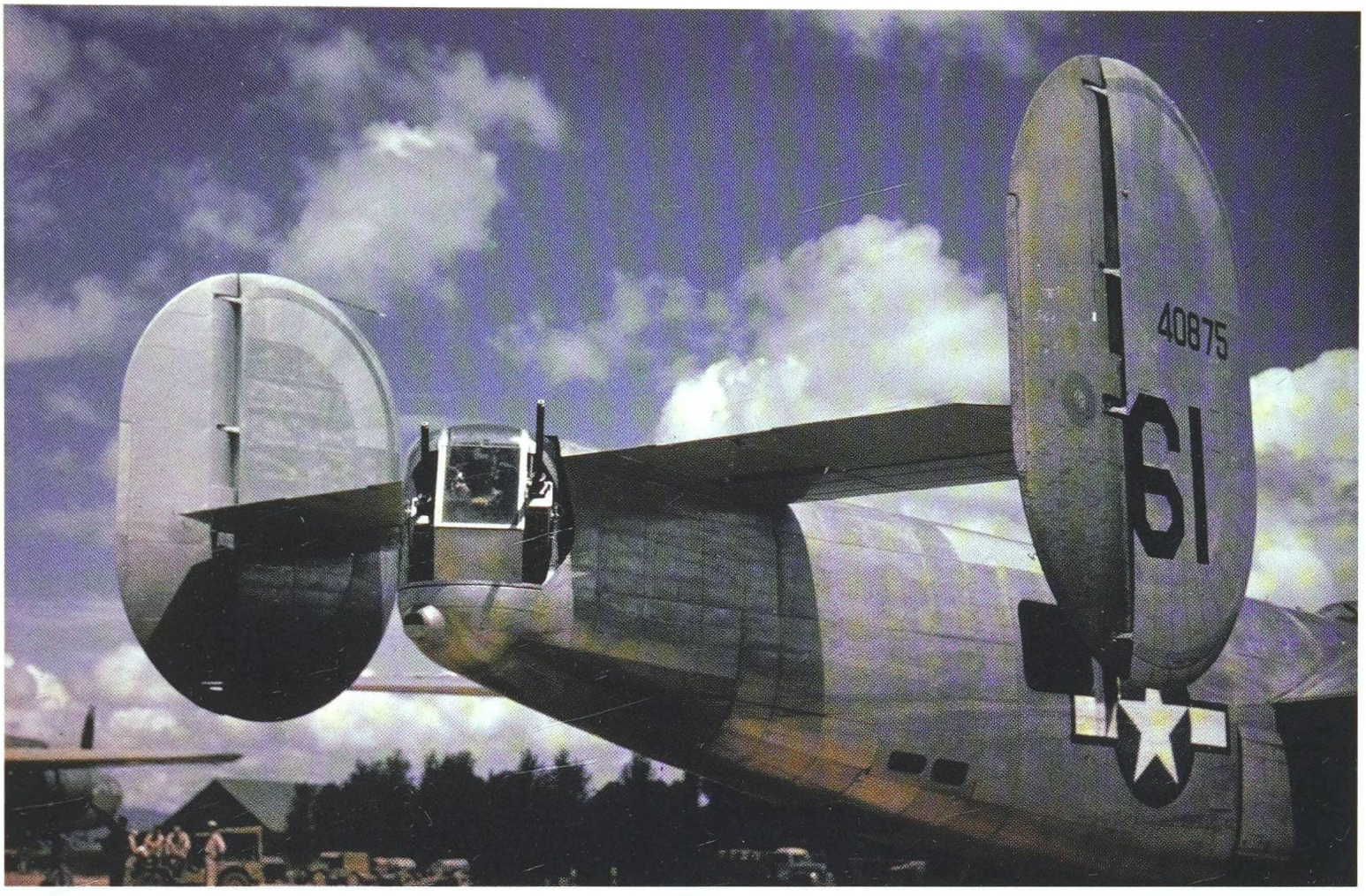
Another member of Crew 65 of the 755th Bombardment Squadron, TSgt. James R. Holman, poses at a waist machine gun in his B-24. Sgt. Holman was the flight engineer of his plane and also doubled as a waist gunner. *National Archives*

The nickname "Arise My Love and Come with Me" is emblazoned on the side of the cockpit of B-24J-5-FO, USAAF serial number 42-50768. A freshly installed armor plate below the side window of the cockpit canopy obscures the upper part of the pinup nose art. The plane and crew were assigned to the 753rd Bomb Squadron, 458th Bombardment Group, 8th Air Force.
National Archives

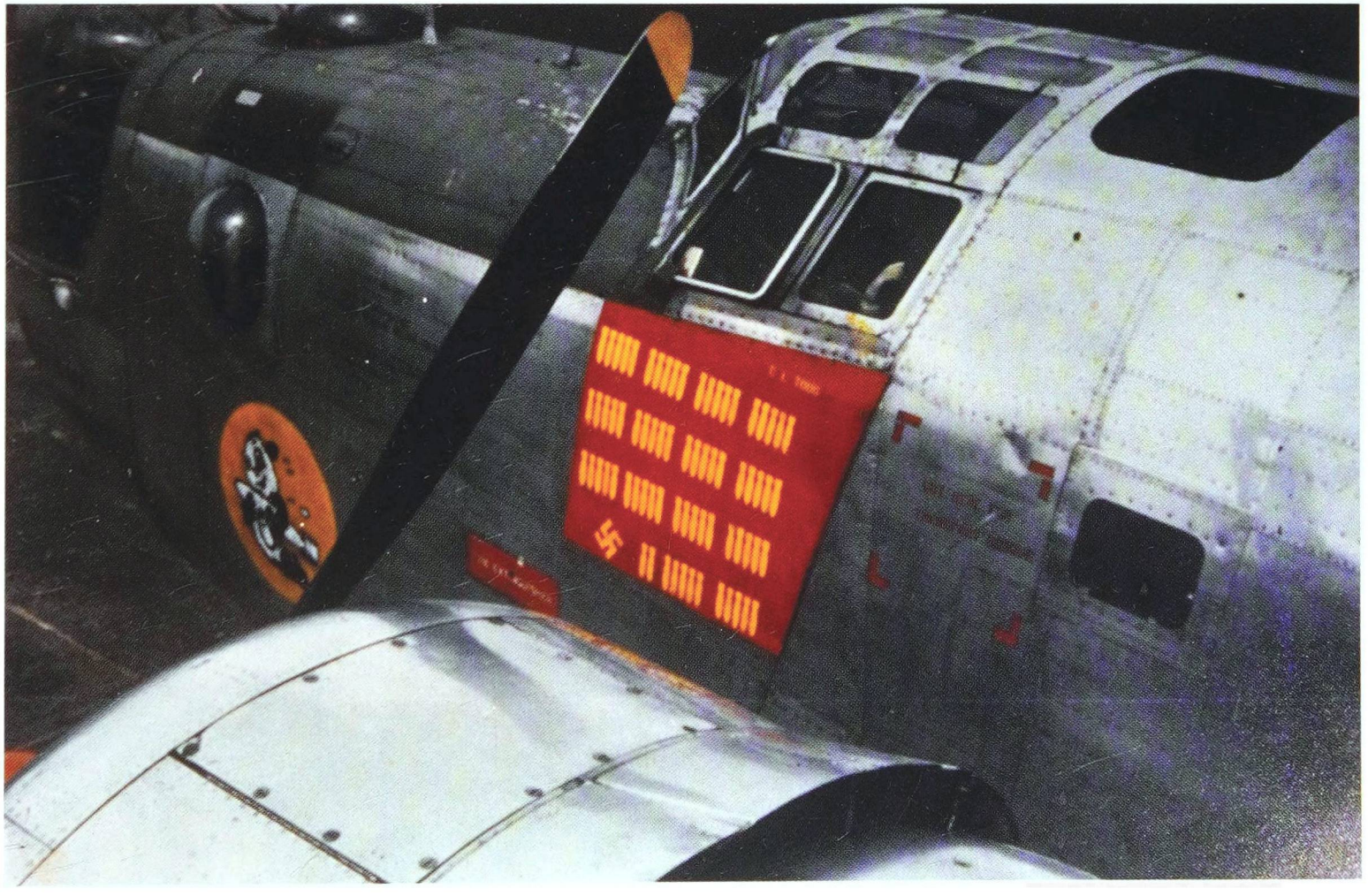
"Betta Duck" was the nickname of B-24J-165-CO, serial number 44-40454, from the 34th Bombardment Group, seen coming in for a landing at RAF Mount Farm, England. The tail number, 40454, is visible on the inner side of the right vertical tail.
Roger Freeman collection

Two Liberators from the 44th Bombardment Group ("Flying Eightballs"), including B-24J-65-CF, serial number 44-10553, in the foreground, are flying in formation over the English countryside. The "WQ" squadron code on the fuselage indicates that this B-24J was assigned to the 66th Bombardment Squadron, based at RAF Shipdham, England.
Roger Freeman collection

A tail gunner is visible through the flat aiming window of the Consolidated tail turret of a B-24 Liberator. The tail number is missing its first digit, but the plane appears to have been B-24J-185-CO, USAAF serial number 44-40875. The bulge at the extreme tail of the fuselage below the turret contains the bomb-release lights: a white light warned other planes in the formation when the bomb bay doors were opened, and a red light went on when the bombs were being dropped. *National Archives*



This photo presents a detailed view of the scoreboard and other markings on the forward left side of the fuselage of B-24J-65-CF, serial number 44-10578, which was nicknamed "The Flyin' Moose!" of the 93rd Bombardment Group. On the red scoreboard are seventy-two yellow bombs, signifying bombing missions, and a single yellow swastika, signifying a kill of an enemy aircraft. The red rectangle below the scoreboard is a fire-extinguisher access door. Below the navigator's blister side window is the insignia of the 409th Bombardment Squadron: a panda bear carrying a bomb, on a yellow circle. *Roger Freeman collection*

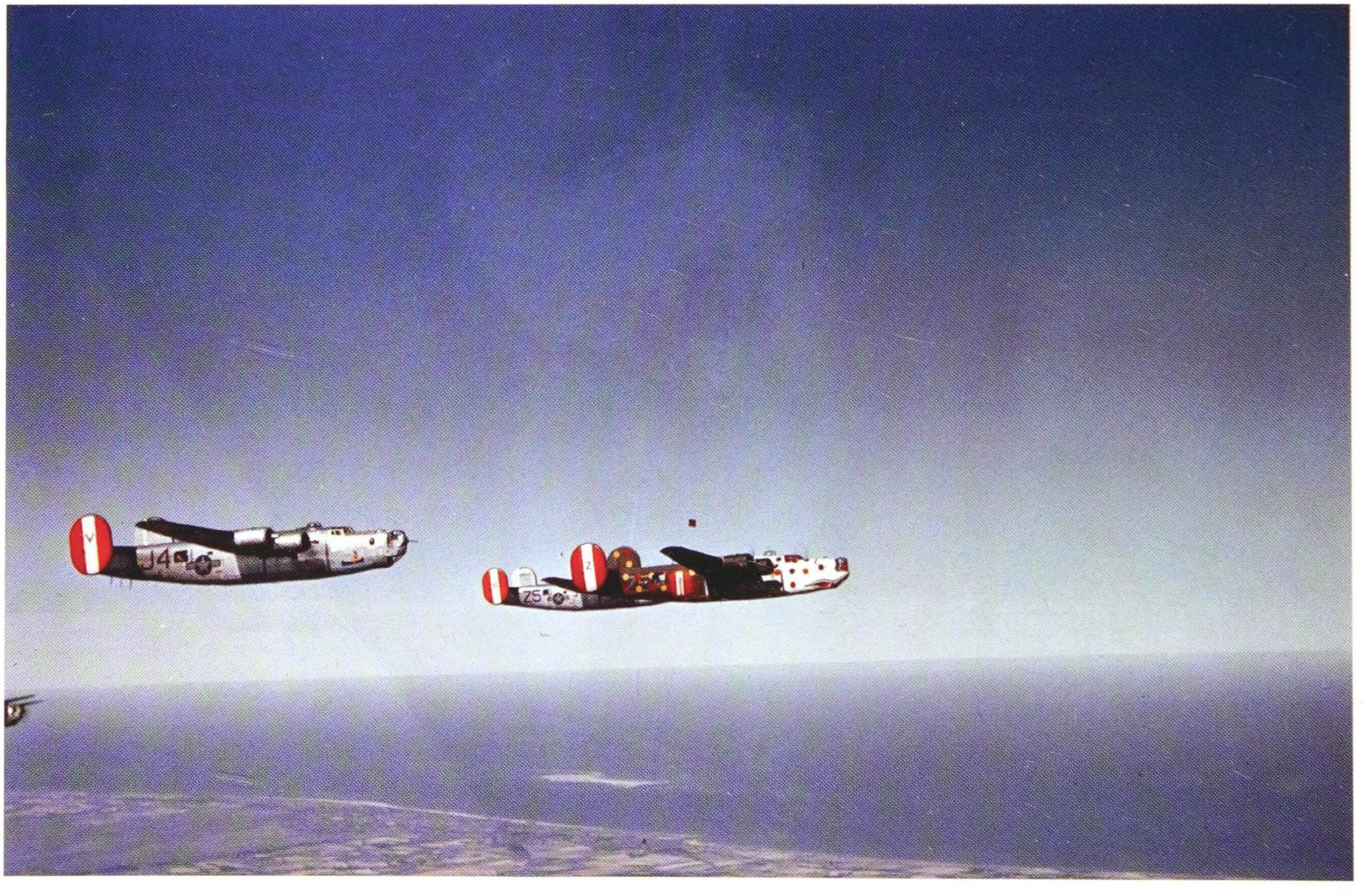


Armorers wheel a large bomb on a dolly toward the bomb bay of a B-24J. To the right is a bomb-service truck, for transporting munitions and armorers to bombers. The Liberator shows signs of having been heavily retouched with a mismatching shade of Olive Drab paint. Note the flash suppressors on the muzzle ends of the .50-caliber nose guns, and the bulge in the side window of the cockpit, for better visibility. *National Museum of the United States Air Force*

Shark teeth and eyes were popular motifs on US aircraft in World War II, giving the planes a fierce aspect, and to emphasize the point this B-24J-145-CO was dubbed "Tubarâo," or "shark" in Portuguese. The plane served as an assembly plane, a gaudily painted aircraft that served as a highly visible point for the planes of a bomber formation to assemble on. *Stan Piet collection*

With their expansive exterior surfaces, the noses of B-24s proved an inviting canvas for nose art. One of the most famous examples was "The Dragon and His Tail," B-24J-190-CO, serial number 44-40973. The paintwork of the dragon tail actually extended to the rear of the fuselage. The plane was part of the 64th Bombardment Squadron, 43rd Bombardment Group, 5th Air Force. *Stan Piet collection*

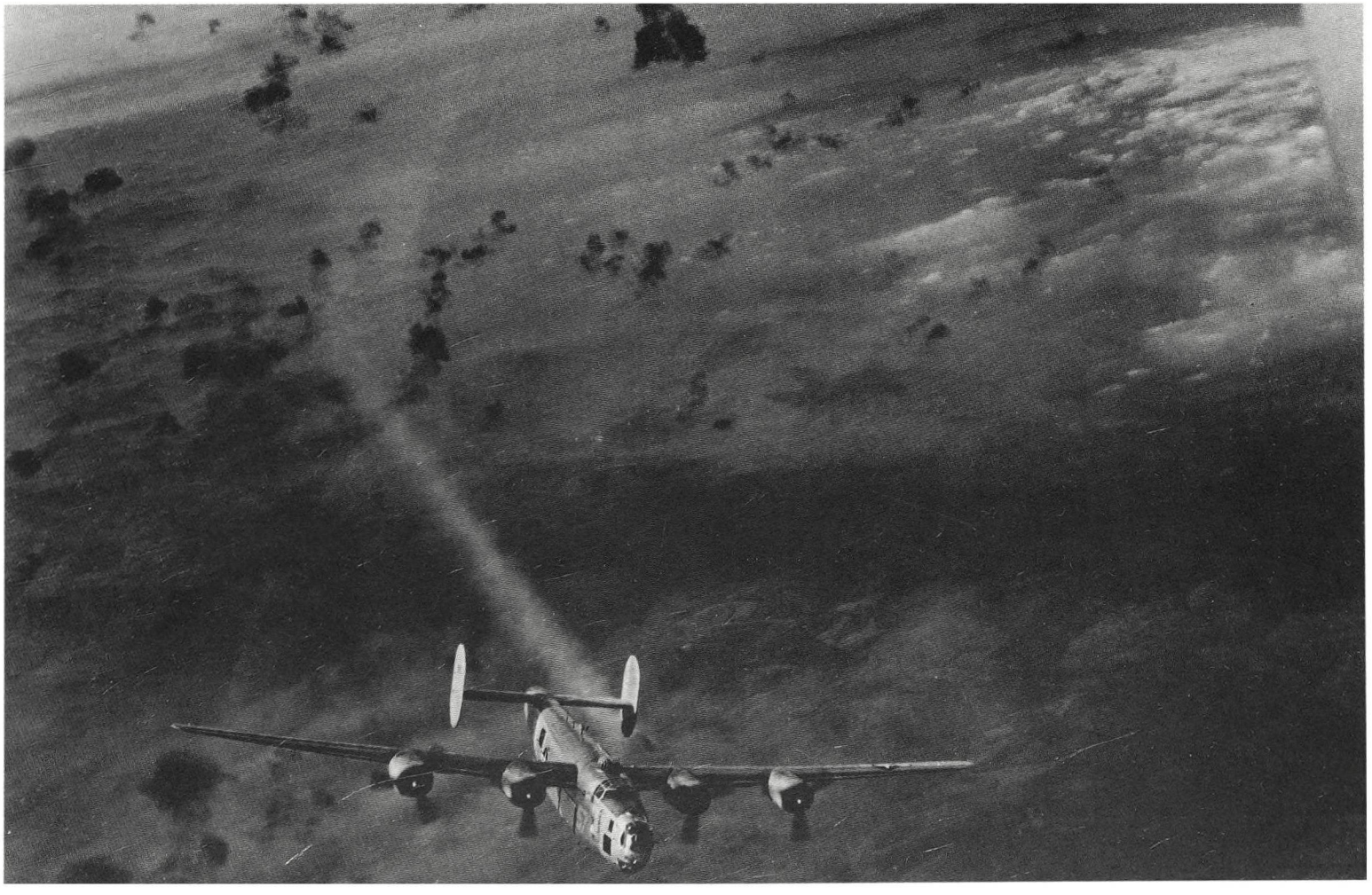
The nose art of "War Goddess," B-24J-105-CO, serial number 42-109816, code YM-N, from the 409th Bombardment Squadron, 93rd Bombardment Group, is shown after the aircraft went missing in action on June 21, 1944, and had to make a forced landing in Sweden. The Liberator was interned there for the duration of the war. *Roger Freeman collection*



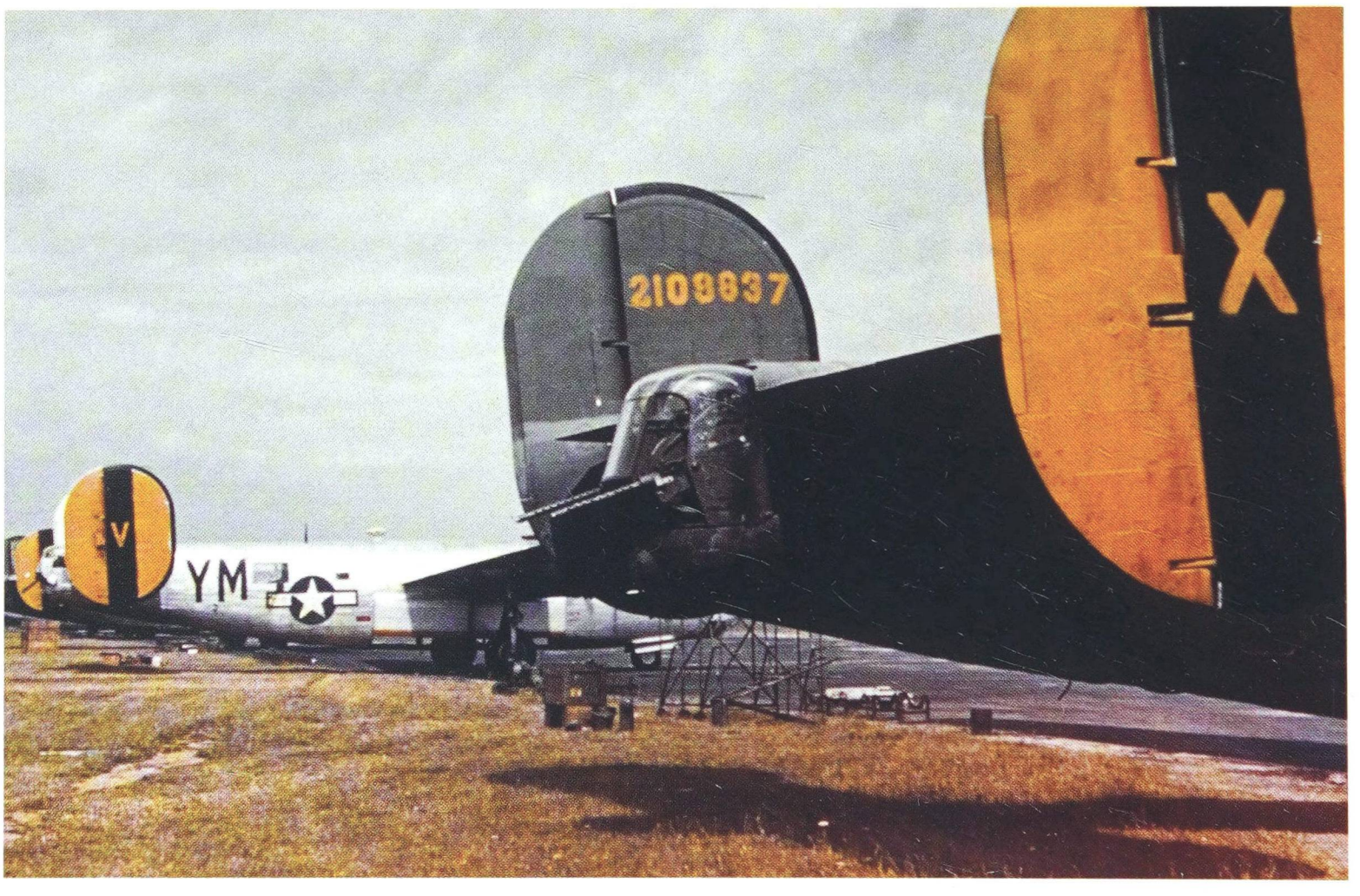
A B-24 assembly plane leads several Liberators high above the English coast. All three of the planes have red, white, and red stripes on the vertical tails, indicating that they were assigned to the 458th Bombardment Group. The "Z5" fuselage codes (the one on the assembly plane is present but hard to discern) pertained to the 754th Bombardment Squadron. *National Archives*

During World War II, the Germans occasionally captured a bomber that went astray and landed on an unfriendly airfield. Often, they repainted the planes in *Luftwaffe* camouflage and applied German insignia. This captured B-24J in *Luftwaffe* colors, with a collapsed nose landing gear, was photographed near Salzburg, Austria, a month after the end of World War II, in June 1945. *National Museum of the United States Air Force*

Flak bursts dot the sky as a wounded B-24 Liberator of the 15th Air Force makes a run for it after being hit during an attack on Vienna on October 13, 1944. While bombers such as the B-24 stood a fighting chance against enemy fighters with their onboard defensive armaments and escorting fighter planes, when it came to flak, they were helpless and at the mercy of pure luck. This bomber had a Martin "high-hat" dorsal turret, and the number 57 was painted in a light color on the side of the fuselage to the front of the forward bomb bay. *National Museum of the United States Air Force*



Fumes from aviation-fuel leaks were a constant hazard to bombers and other aircraft. Even a small leak, combined with an electrical spark, could lead to a catastrophic explosion in the air or on the ground. The Liberator to the left became engulfed in flames when a spark touched off fuel that was being pumped from the plane's fuel tanks. The Liberator to the right came through unscathed. *National Museum of the United States Air Force*



In another view of Liberators from the 93rd Bombardment Group, the tail of "Bodacious," B-24J-105-CO, serial number 42-109837 and code YM-X, is in the foreground; a good view is available of its Consolidated-type tail turret. In the background is another Liberator, bearing squadron code YM on the fuselage and call letter "V" on the vertical tail. *Roger Freeman collection*

After World War II, US war machinery that was deemed to be of potential use in the postwar, atomic-age military equipment was kept in service, but for many of the planes, especially in the more remote corners of the globe, it was more economical to scrap them where they were than to transport them home. Such was the fate of the Liberator at the right in this photo of a Pacific scrapyard. *Stan Piet collection*

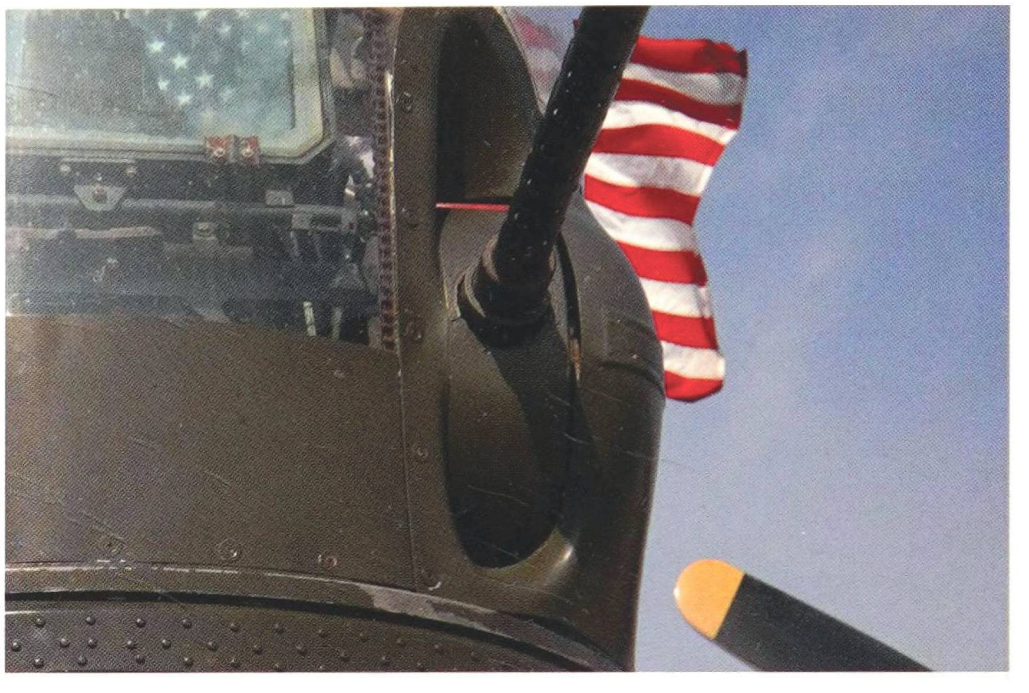
This Consolidated Vultee B-24J-85-CF was repainted to represent "Witchcraft" in 2005. The original "Witchcraft" was B-24H-15-FO, serial number 42-52534, assigned to the 467th Bombardment Group of the 8th Air Force. More than seventy years after the plane was constructed at Consolidated Vultee's plant in Fort Worth, Texas, it continues to fly. *Rich Kolasa*

"Witchcraft" is observed from above, providing a clear view of its forward fuselage, cockpit canopy, top turret, engine nacelles, and propellers. The leading edge of the fairing on the fuselage to the immediate rear of the Emerson A-15 nose turret has a continuous curve. Various models and submodels of the B-24J had different-shaped fairings, which can serve as an aid in identifying Liberators by model and manufacturer.

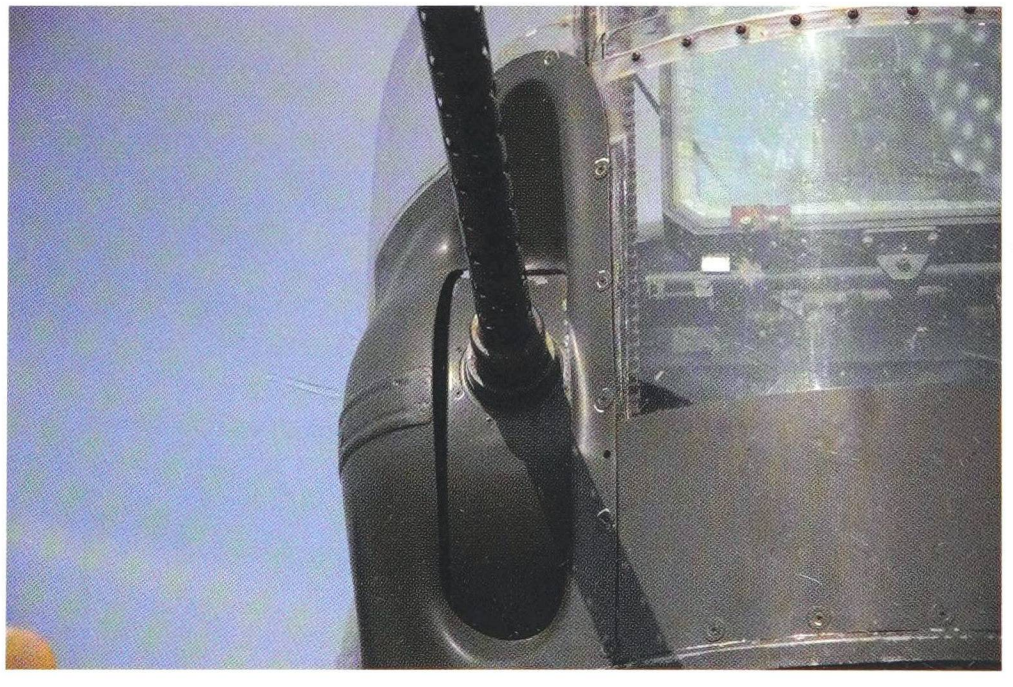
The nose of "Witchcraft" is viewed. The Emerson A-15 turret is armed with two Browning .50-caliber machine guns. Inside the front of the turret's Plexiglas dome is a piece of bulletproof glass to protect the gunner. Below the turret is the bombardier's window.

The Emerson A-15 nose turret was electrically powered, with high-speed or low-speed tracking. It could be traversed 75 degrees to each side of the centerline, and its .50-caliber machine guns could be elevated to 60 degrees or depressed 50 degrees from horizontal.

The barrels of the .50-caliber machine guns protrude through curved, movable fairings that kept wind from blowing into the turret. These fairings and the molded fairings that are part of the turret enclosure were collectively referred to as the gun shield. *Chris Hughes*



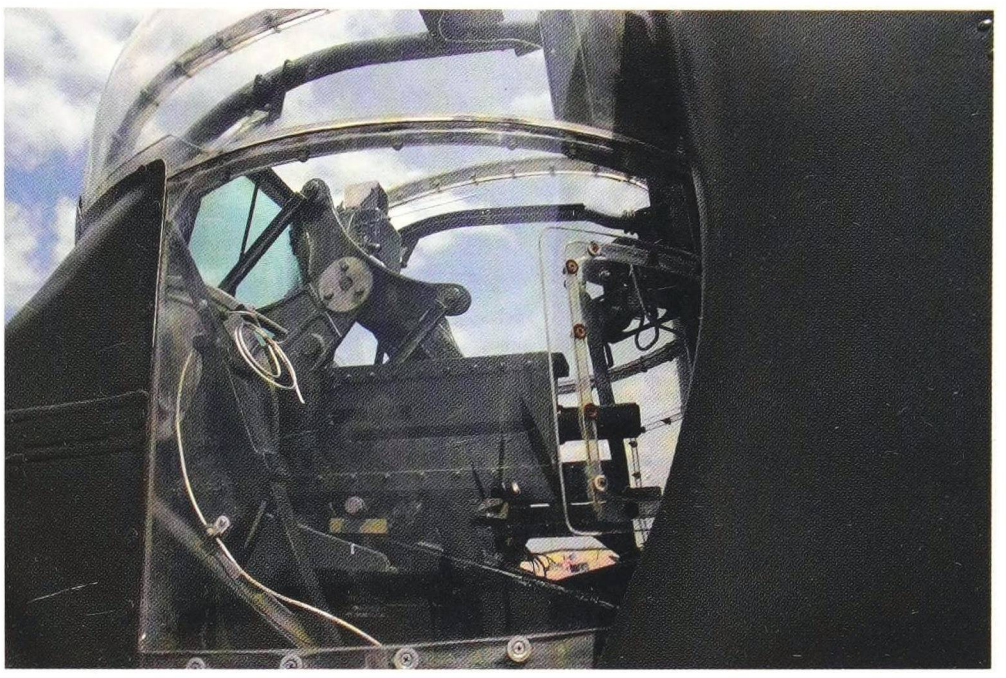
Visible inside the Plexiglas shell of the nose turret, next to the gun shield, is a bicycle chain, used along with a sprocket to move the bulletproof glass in unison with the elevation of the guns. The gun barrel sleeves are perforated for cooling purposes.



The right side of the A-15 turret is viewed from the front, showing the movable and fixed parts that made up the gun shield on that side of the turret. The thickness of the bulletproof glass mounted inside the Plexiglas dome toward the top right can be seen.

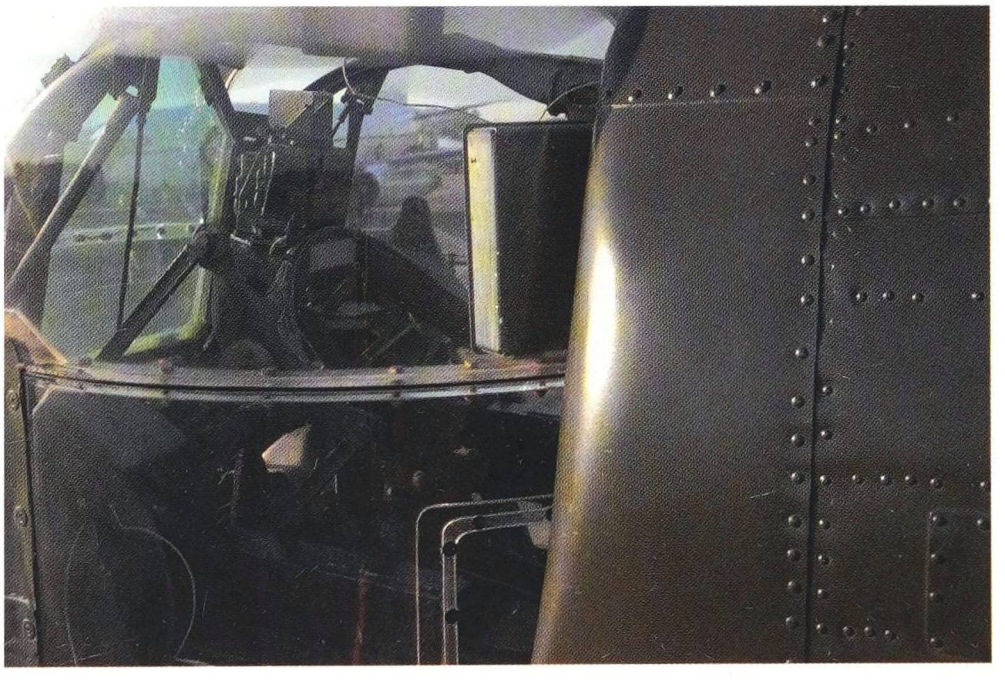
The clear components that make up the dome of the Emerson A-15 nose turret are formed of Plexiglas moldings, fastened together to complete the assembly. On the fuselage below the turret are several louvered air vents in the form of individual panels fastened in place.

Visible inside the turret are the left .50-caliber machine gun receiver, the side of the bulletproof glass, and components of the gun mount and the internal frame. At the bottom of the side of the Plexiglas dome are fasteners that attach it to the turret structure. *Chris Hughes*

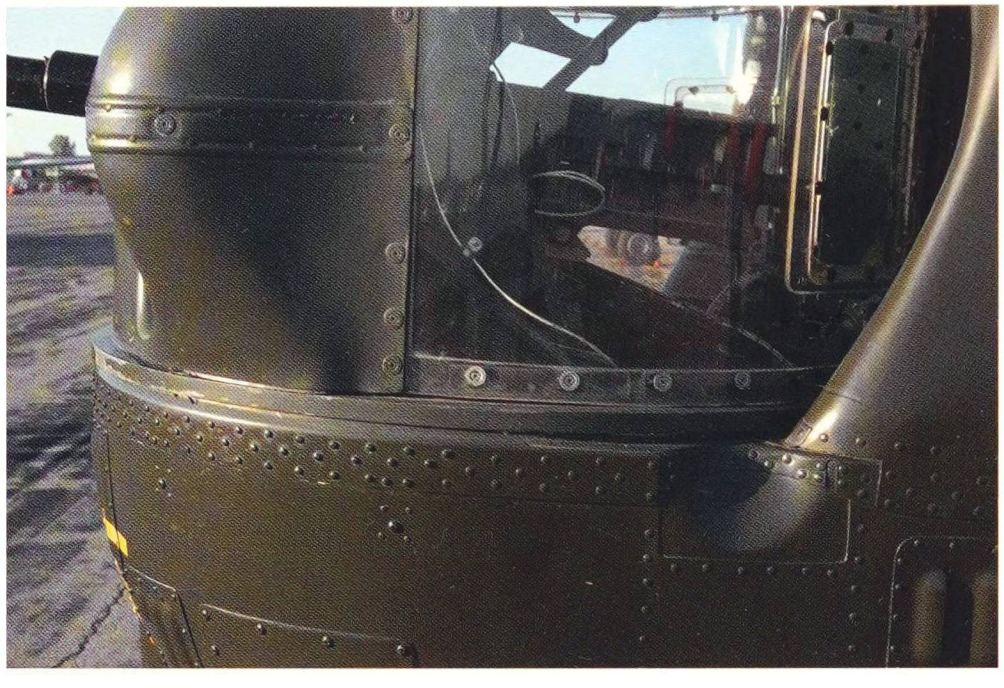


In a close-up view of the lower left side of the clear dome of an A-15 turret, the rectangular panel in the Plexiglas toward the right is the left gun installation panel. Removing these panels provided clearance for removing or installing the guns.

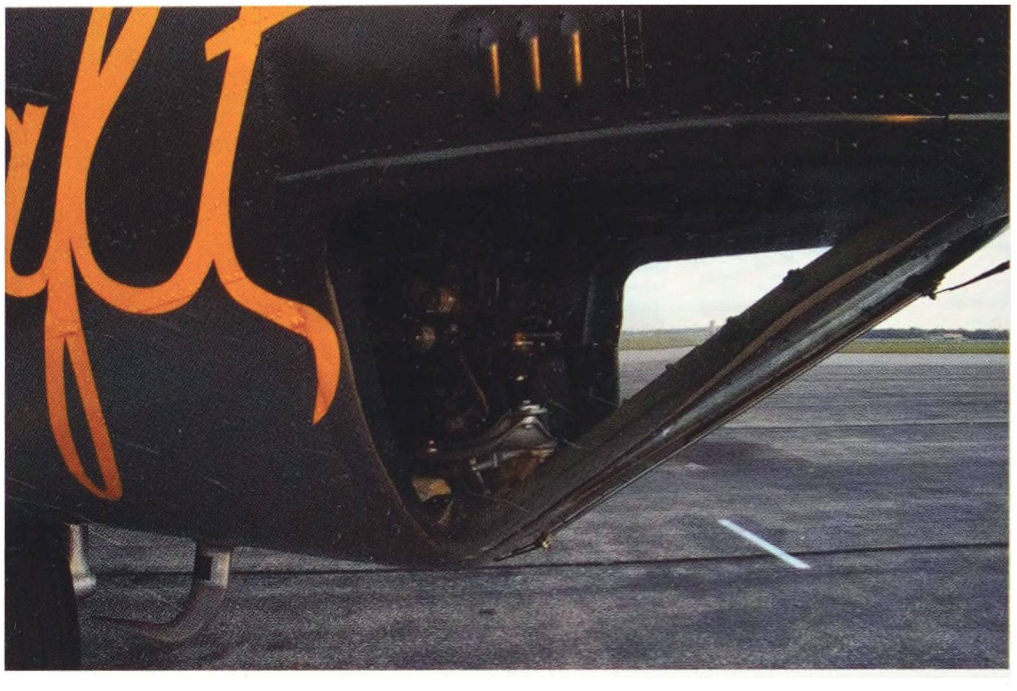
Each Browning M2 .50-caliber machine gun was mounted in a cradle, which provided a firm support for the gun in its elevating mount. Not visible from the outside is the turret tub, a semiconical structure that provided a floor and lower structure for the turret. *Chris Hughes*



Looking through the left side of the nose turret dome, toward the upper right is a yoke or cradle that held the gunsight. In the Emerson A-15 turret, the N-6A or N-8 optical gunsight was used. The sight could be adjusted right or left but not up or down.

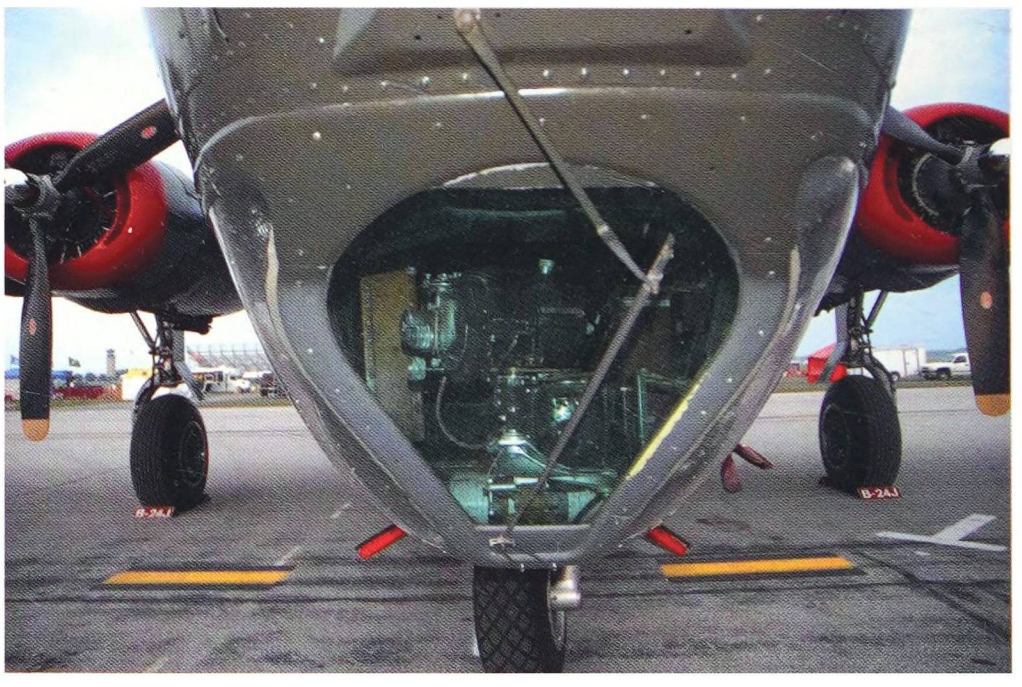


Close details are visible of the area where the left side of the nose turret dome meets the front of the fuselage. The left gun installation panel, toward the upper right, was not hinged but was held in place by fasteners on all four sides of its perimeter.



The right side of the bombardier's window is observed. Here again, the Norden bombsight, with its aluminum-colored adjustment knobs, is visible inside. In earlier B-24s without the nose turret, the bombardier also acted as the nose gunner.

The bombardier's window is viewed from the left side. The assembly comprised two side panels and an optically flat front pane, held in place by a frame. Visible inside the window is the heart of the bombardier's array of instruments: a Norden bombsight.



The front pane of the bombardier's window, optically flat to allow distortion-free viewing through the Norden bombsight, had a windshield wiper, the bottom of which was on a swivel mount and the top of which was swung side to side by a motorized arm.

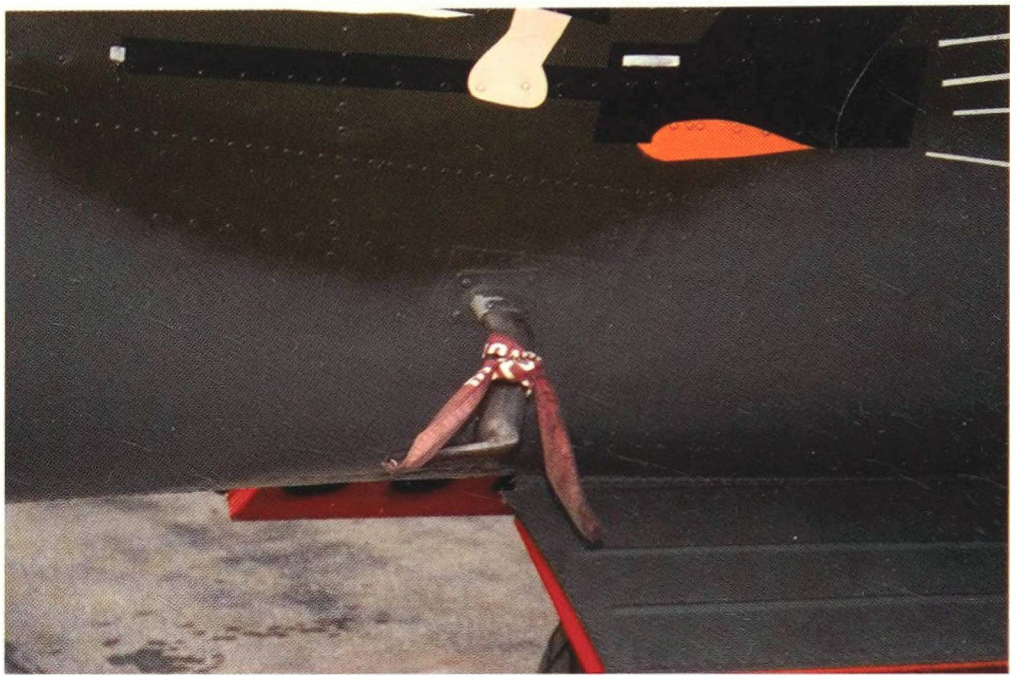
Originally, nose landing-gear doors on B-24s opened upward into the landing-gear bay when the gear was extended, but on B-24Js except most of those built at Consolidated Vultee's San Diego plant, the nose-gear doors opened downward, as seen here.

The nose landing gear is of a single-fork design, the fork being on the opposite, or left, side of the wheel. The wheels were manufactured by Goodyear, and the right side of the wheel has eight spokes. Thirty-six-inch, ten-ply tires were specified for the nose gear.

The inside of the left nose landing-gear door and a small part of the right door are visible in this photo. The diamond-type pattern of the tire tread on the nose wheel can be seen. Forward of the left door is the pitot tube, fitted with a protective cover.

The single fork of the nose landing gear is observed from the left side of the B-24J. A double-weld bead runs up the side of the fork. At the bottom fork is the hollow axle. The left side of the wheel is not identical to the right side, having eight lightening holes.

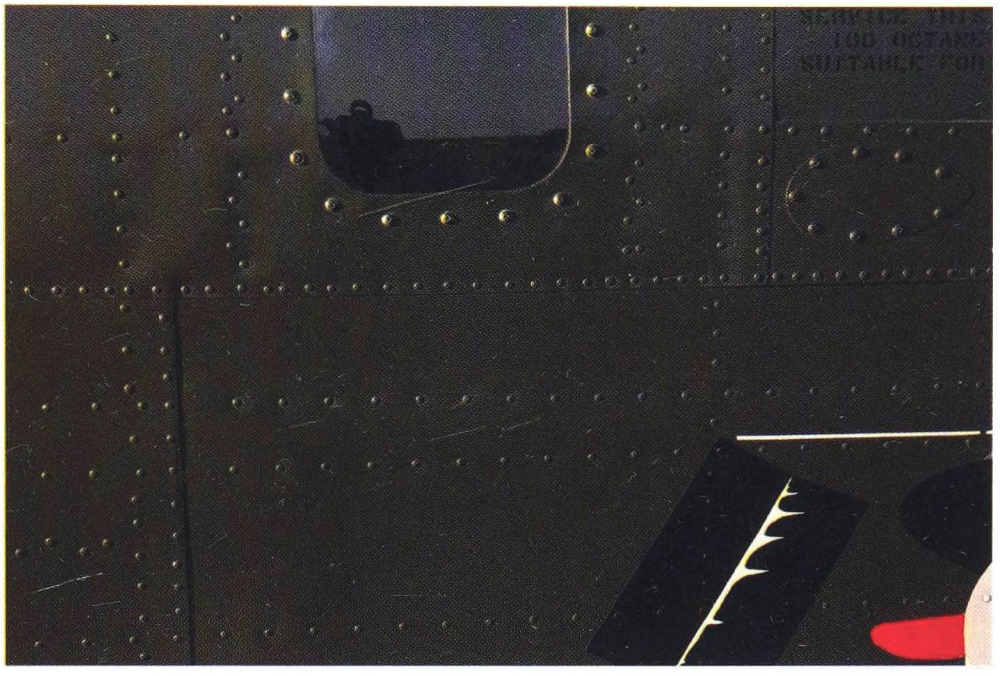
Above the top of the fork of the nose landing gear, as viewed from the left side, is an oval-shaped mudguard with lateral stiffeners stamped into it. Above the mudguard is the torque link, or scissors, to the rear (*right in the photo*) of which is the oleo piston.



Initially, B-24Js were fitted with a type D-1 pitot tube on a long mast on each side of the upper forward fuselage. Beginning with the B-24J-75, these were replaced by a single G-2 pitot tube low on the left side of the fuselage, just forward of the nose landing-gear door.

"Witchcraft" is viewed from the left side, showing the configuration of the B-24's tricycle landing gear. Long main landing-gear struts were necessary because of the high wing. Despite the main struts' length and seemingly fragile appearance, they actually were very strong. The distinctive tail markings, red with a diagonal white stripe, were devised for the 467th Bombardment Group in 1944. The code for the 790th Bomb Squadron, Q2, is on the fuselage, and the individual aircraft code, M, is on the tail.

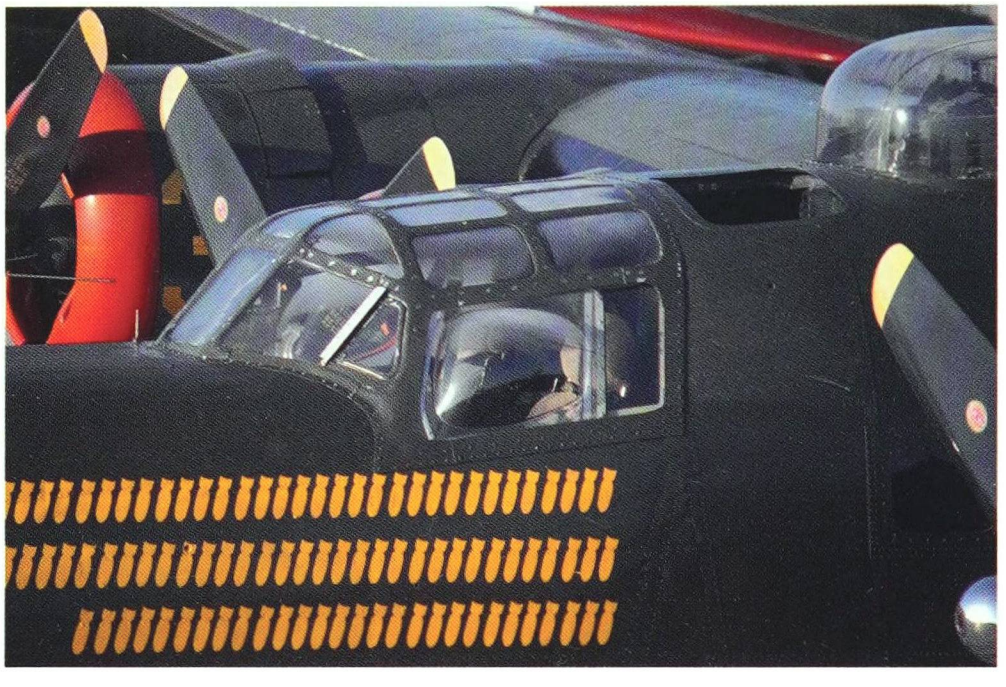
The nose art of the original "Witchcraft" of the 467th Bombardment Group is replicated on Consolidated Vultee B-24J-85-CF Liberator, serial number 44-44052. Small, yellow bomb symbols represent the 130 combat missions flown by the original "Witchcraft."



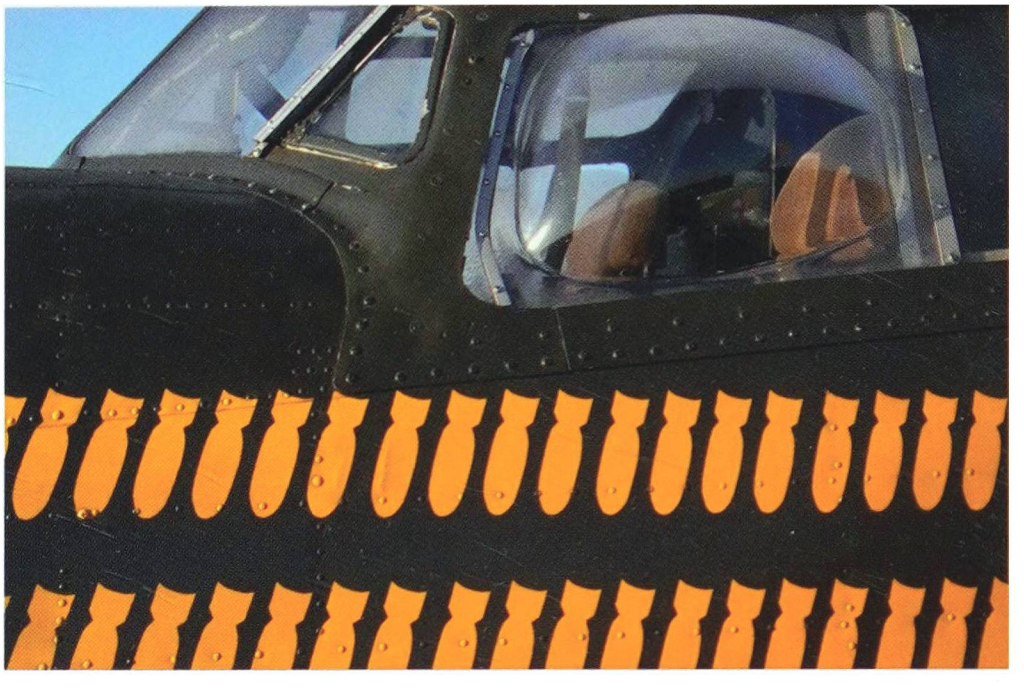
The fuselage skin below the left window in the bombardier's compartment is displayed. The aircraft's fuselage is of semimonocoque design, with Alclad skin panels riveted to a frame comprising Alclad stingers, stiffeners, transverse bulkheads, and belt frames.

The left panel of the cockpit canopy is a sliding assembly and features a blister in the Plexiglas, giving the pilot a better field of view. The small, red panel is a door for a compartment containing a handheld carbon tetrachloride fire extinguisher.

Faintly visible below the bomb symbols aft of the left side window is a replica of the nomenclature and data stencil of the aircraft this B-24J-85-CF currently replicates: B-24H-15-FO, serial number 42-52534. It includes instructions to use 100-octane fuel only.



The pilot's side window with the blister is in the closed position. On the outboard side of the windshield is a small, clear, triangular panel. This was hinged on the inboard side and could be opened to provide a clear view forward if the windscreen fogged or iced.

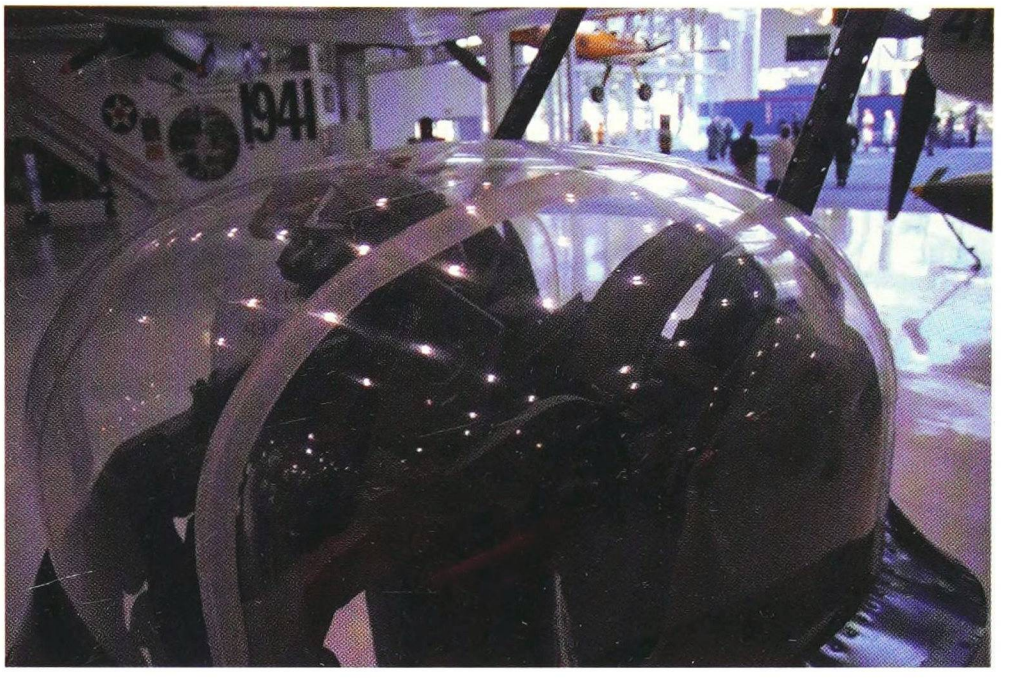


The metal frame of the cockpit canopy overlaps the fuselage skin and is fastened in place with roundheaded Phillips screws. Through the blister of the side window, the khaki-colored, fabric-covered head rests of the pilot's and the copilot's seats are visible.

From a slightly higher elevation than in the preceding photo, the upper part of the frame of the cockpit canopy is visible. Aft of the canopy, the flight-deck hatch is open. This hatch was used for escaping the aircraft after a ditching or an emergency landing.

A small air vent for the bombardier's compartment is above the top-left bomb symbols. Atop the fuselage is an RC-103 blind-landing antenna, which received radio signals from an airfield that allowed the pilot to land in low-visibility conditions.

Aft of the flight-deck hatch is the top turret, in this case a Martin A-3C. This turret had two Browning M2 .50-caliber machine guns in a powered mount, with a clear dome fabricated from Plexiglas. The turret was electrically powered by means of an amplidyne.

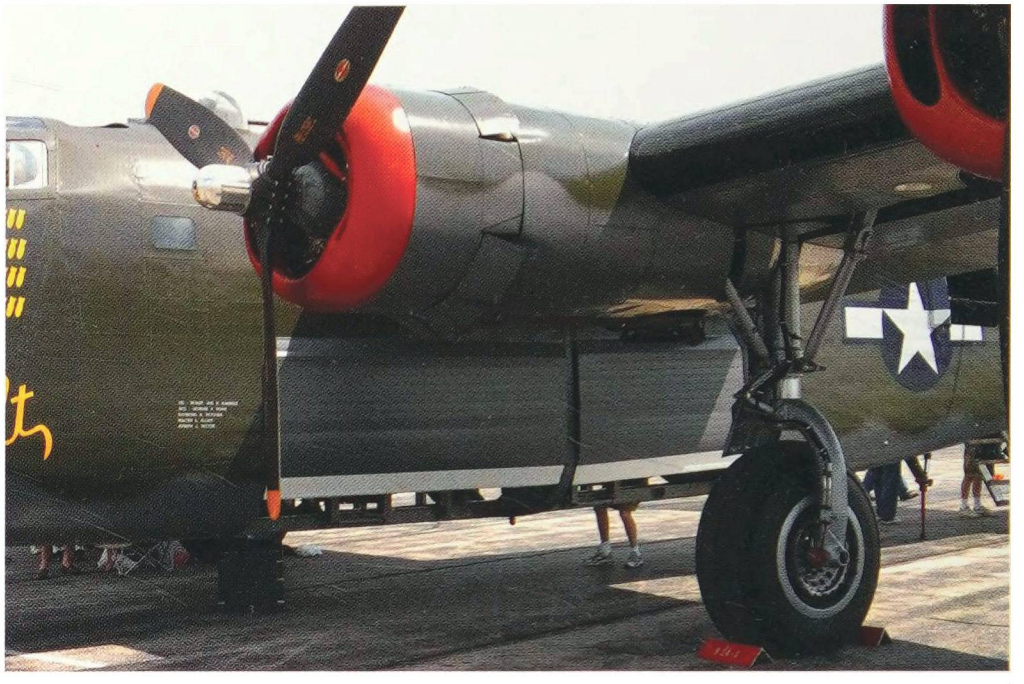


Faintly visible below the top of the clear dome of a Martin A-3C top turret on a display stand at a museum is the gunsight. This type of turret had 360-degree rotation, and the machine guns could be elevated to 85 degrees and depressed 6.5 degrees.

An A-3C turret is viewed from its right-rear quarter, showing the receiver of the right .50-caliber machine gun at the center. The bow-shaped clear part inside the Plexiglas dome is a Plexiglas stiffener, which added a degree of structural strength to the dome. *Karl Marcharo*

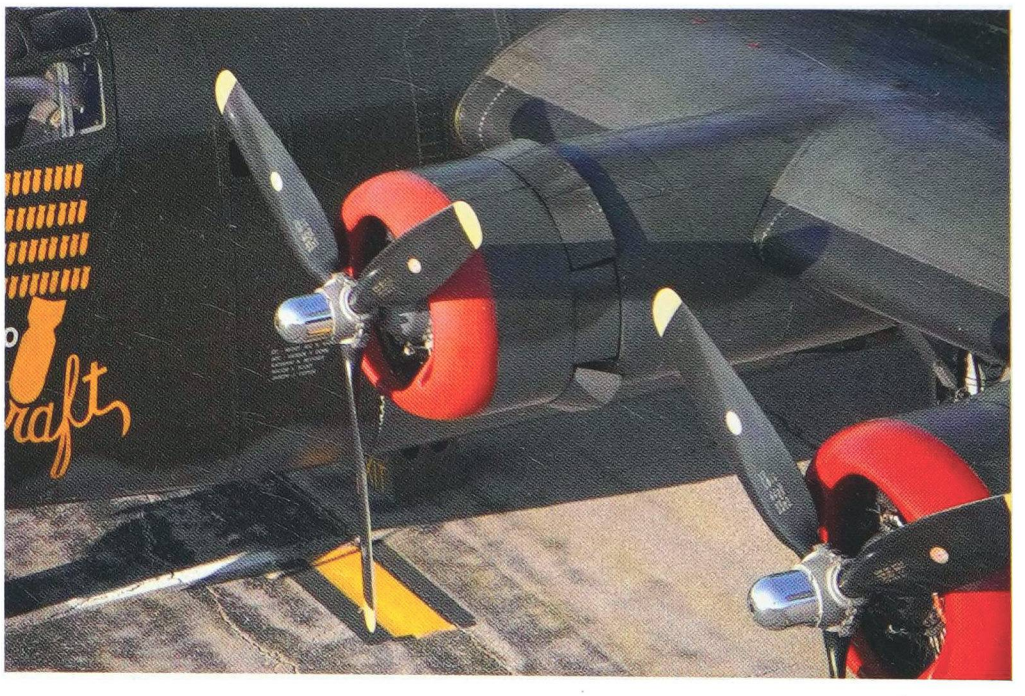
As seen from the front of an A-3C turret, the .50-caliber ammunition is fed into the inboard sides of the .50-caliber machine guns. Booster motors helped feed the linked ammunition to the guns. At the top center, part of the front of the gunsight is in view. *Mike Armstrong*

In a frontal view of an A-3C top turret, at the lower front is a curved piece of armor with a dip on its top. More armor plate was below the turret dome as well. Below the gunsight at the top, the linked ammunition is looped over sprockets attached to the booster motors. *Mike Armstrong*

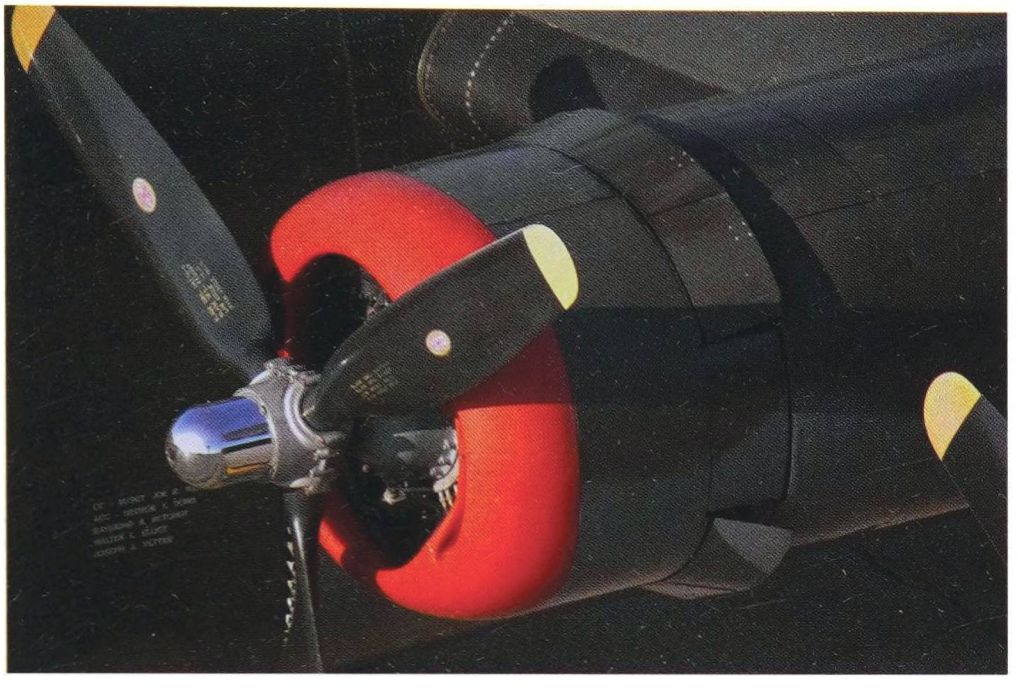


The left inboard engine nacelle and main landing gear and the open left bomb bay door are displayed. The bomb bay doors were of corrugated-metal construction and, when opened, were raised on tracks on the fuselage, creating less drag than hinged doors.

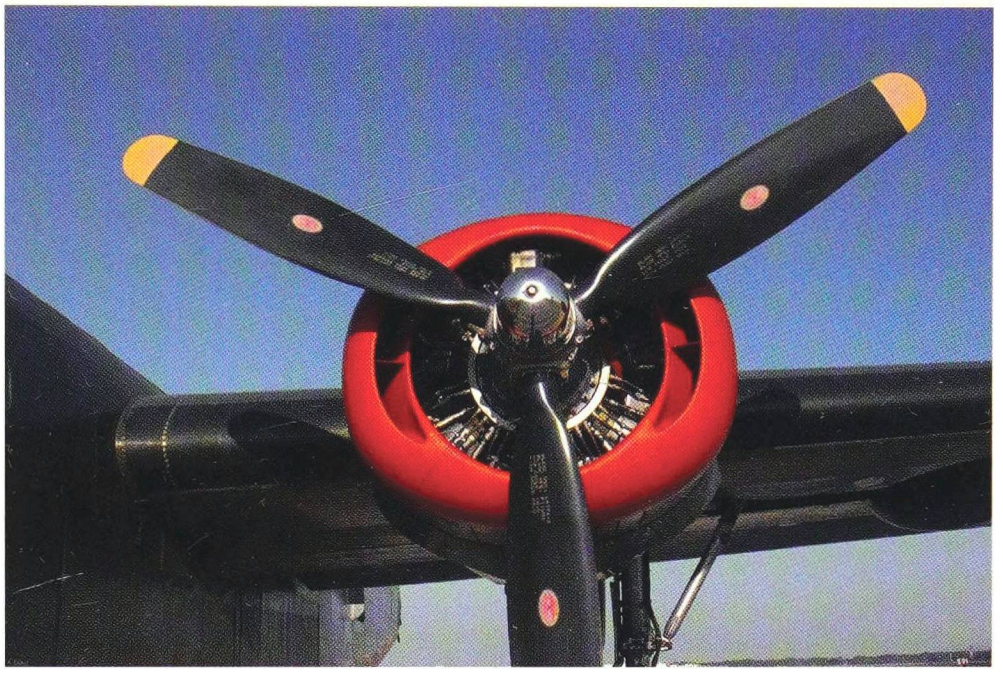
The Martin A-3C top turret on "Witchcraft" is observed from forward and slightly below it on the left side of the plane. The Plexiglas stiffeners inside the dome of the turret were bonded to the dome and yielded better visibility than metal frames would have. *Chris Hughes*



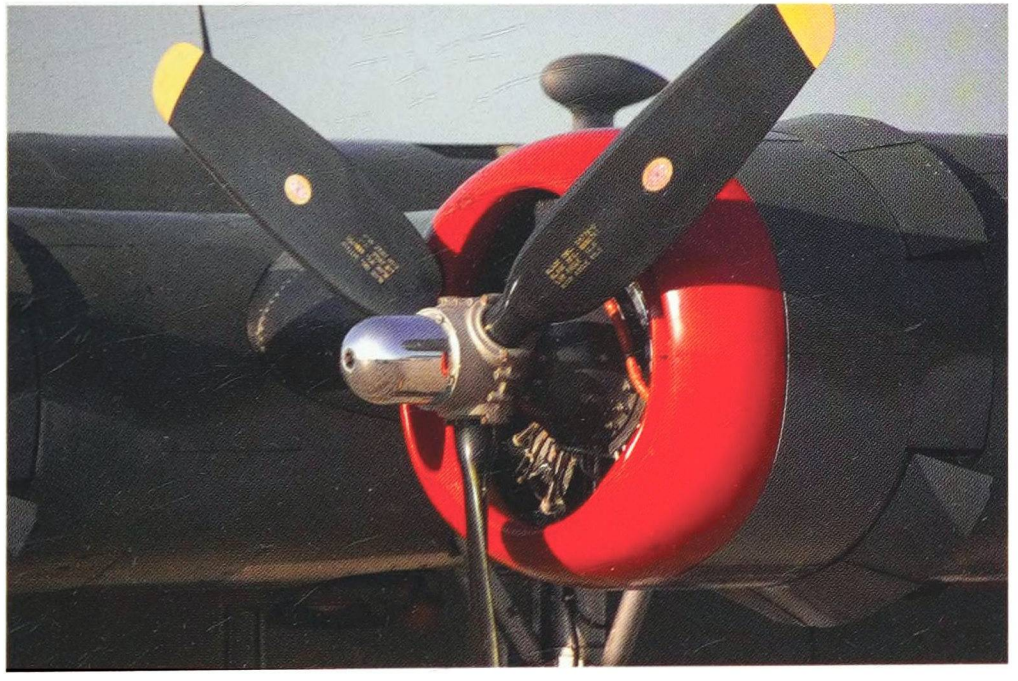
The inboard left engine nacelle, cowl flaps open, is viewed from above. Housed inside each of the four nacelles of B-24Js was a Pratt & Whitney R-1830-65 Twin Wasp air-cooled, 14-cylinder radial engine with a General Electric B-22 turbosupercharger. The R-1830-65 was rated at 1,200 horsepower at 2,700 rpm for takeoff and could maintain this horsepower to up to 31,800 feet in altitude.



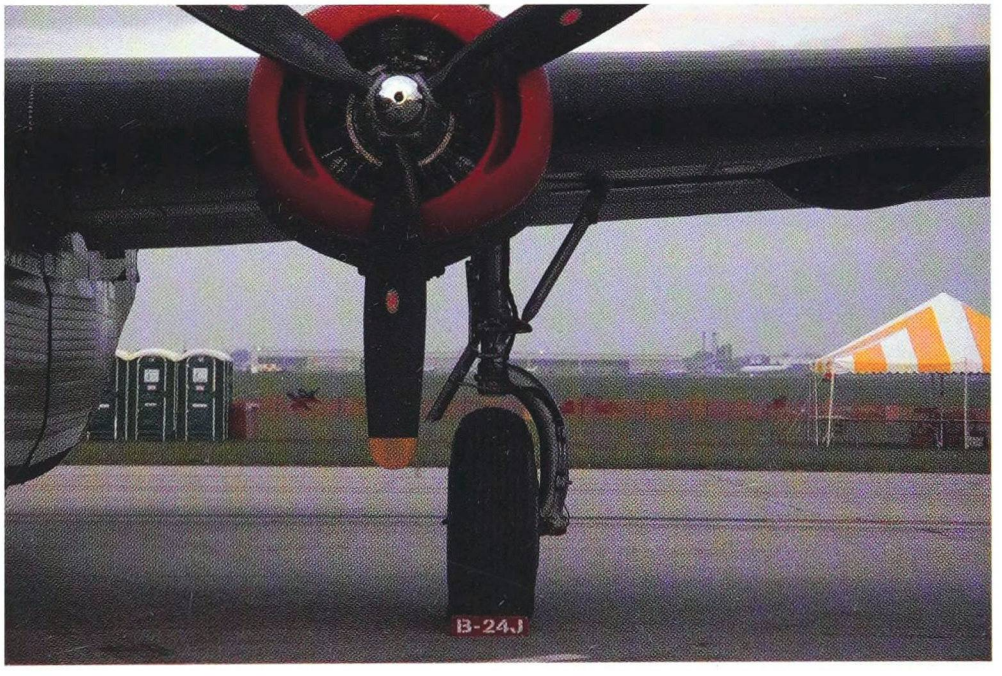
B-24s pioneered the use of Hamilton Standard Hydromatic three-bladed, constant-speed, quick-feathering propellers. The chromed dome on the hub serves as a cover for the pitch-changing mechanism. The paddle-type blades were designed for high altitudes.



On the cheeks of the cowls are air scoops. As seen from the front, the right scoop conducts air to the intercooler and the turbosupercharger, while the left scoop admits air for the supercharger, the oil cooler, and the generator. A horizontal fin is in each scoop.



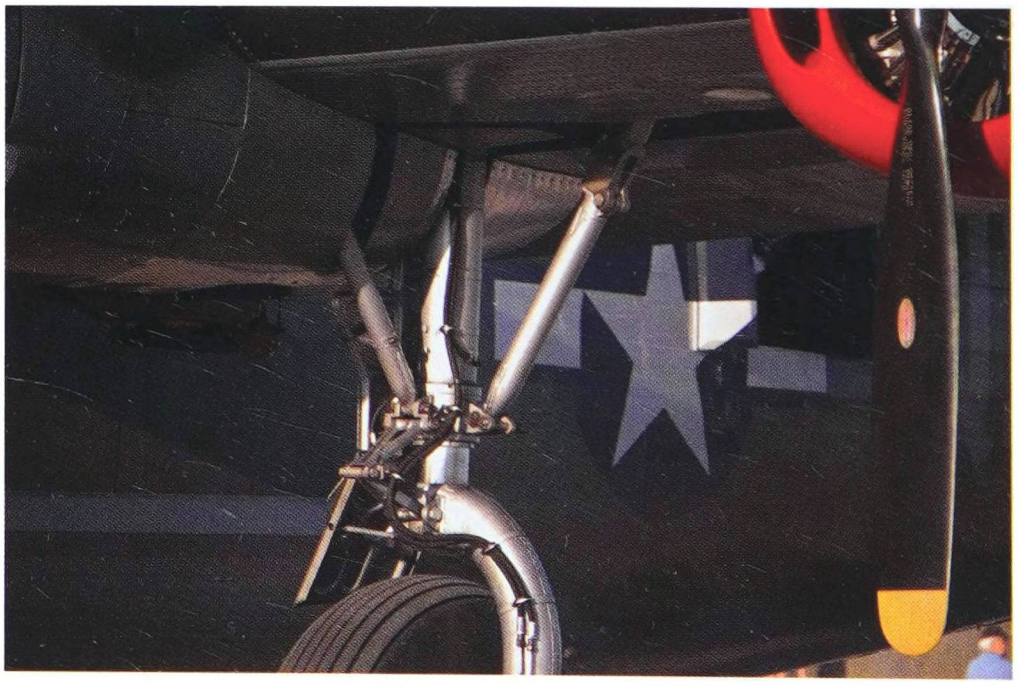
Stenciled in yellow on the propeller blades is the blade model, G477A-0. On the next line is the manufacturer's code, NKWG761. The third line cites the blade's low angle, 16.0 degrees, while the last line gives the blade's high angle, 88.0 degrees.



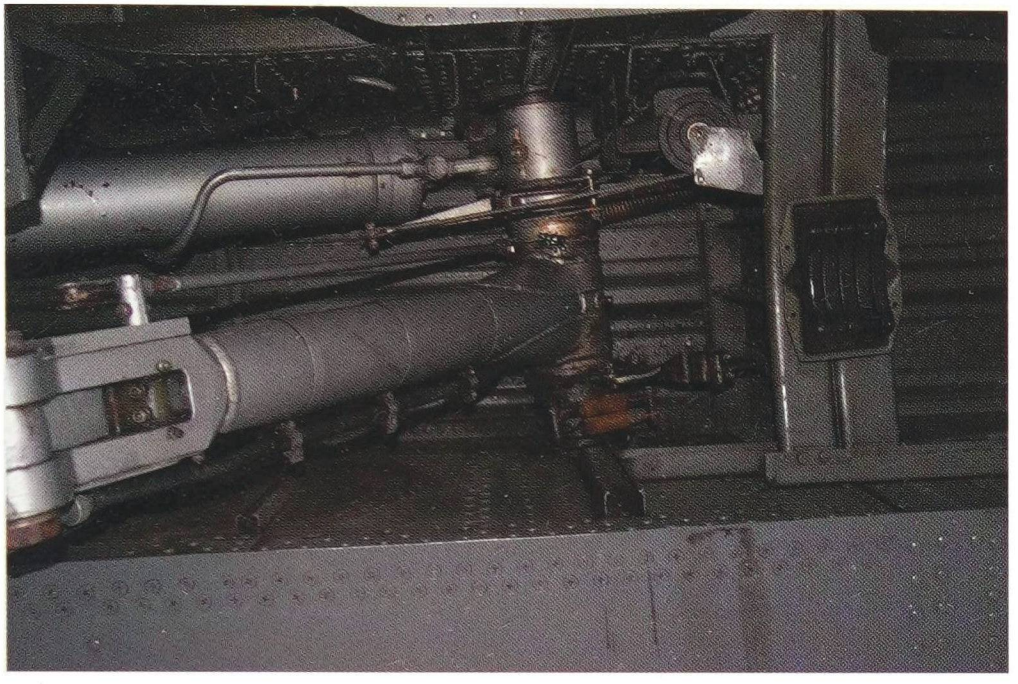
The left main landing gear is viewed from the front. The oleo strut when viewed from this angle is nearly perpendicular to the ground. The main landing gear retracts outward into a landing-gear bay recessed into the bottom of the wing, visible to the top right.

The left main landing gear is viewed facing inboard toward the fuselage. The main landing-gear struts were of hydropneumatic design. The wheels were Air Corps Type 111, with aluminum- or magnesium-alloy castings. Part of the main landing-gear bay is visible at the top. Forward of the bay is the lens for the left landing light; another landing light is situated in a similar location under the right wing.

The main landing-gear assembly is supported by two auxiliary spars of plate-girder design, riveted to two main-wing bulkheads. At the top of the photo, hat-section stiffeners riveted to the skin of the wing give a corrugated appearance to the top of the wheel well.



The upper part of the left main landing gear is viewed from the front. To the front of the oleo strut is the torque link, above which is the drag brace. On the outboard side of the oleo strut is the lower side brace. Brake lines are routed along the strut and the fork.



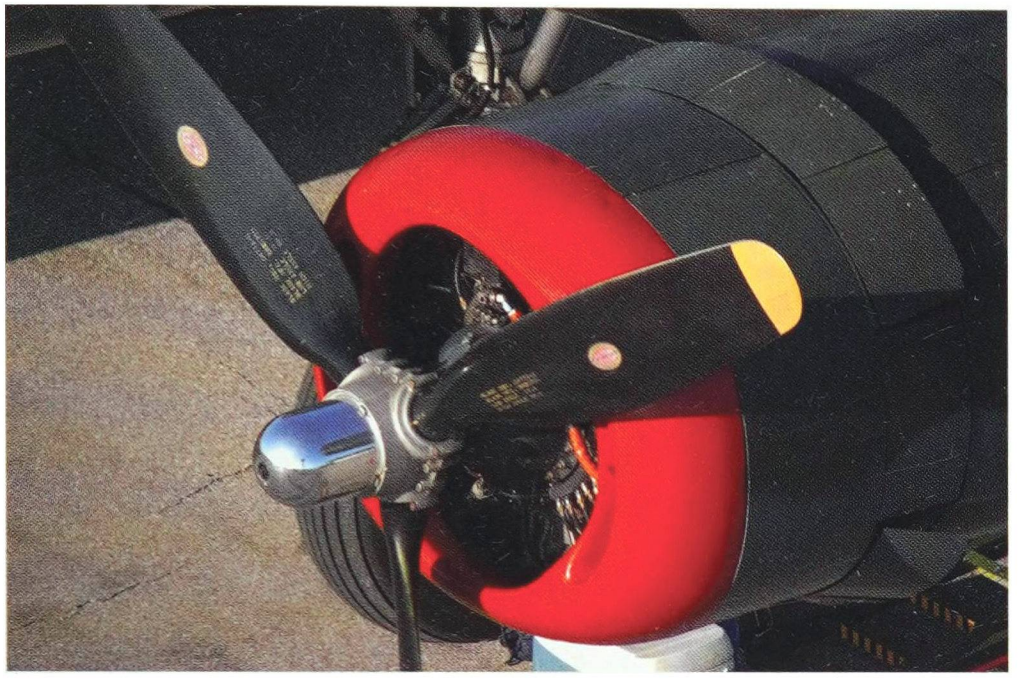
In a view of the upper part of the left main landing gear, toward the lower right is the knuckle and latch near the center of the lower side brace. Parallel to that brace, toward the upper left of the photo, is the hydraulic cylinder that operates the landing gear.

The fork, wheel, and tire of the left main landing gear are viewed facing inboard. At the bottom of the single fork is a hollow axle, fastened to which is an orange towing eye. The tires were 56 inch, 16 ply. In the background are the nose landing gear and its left door.

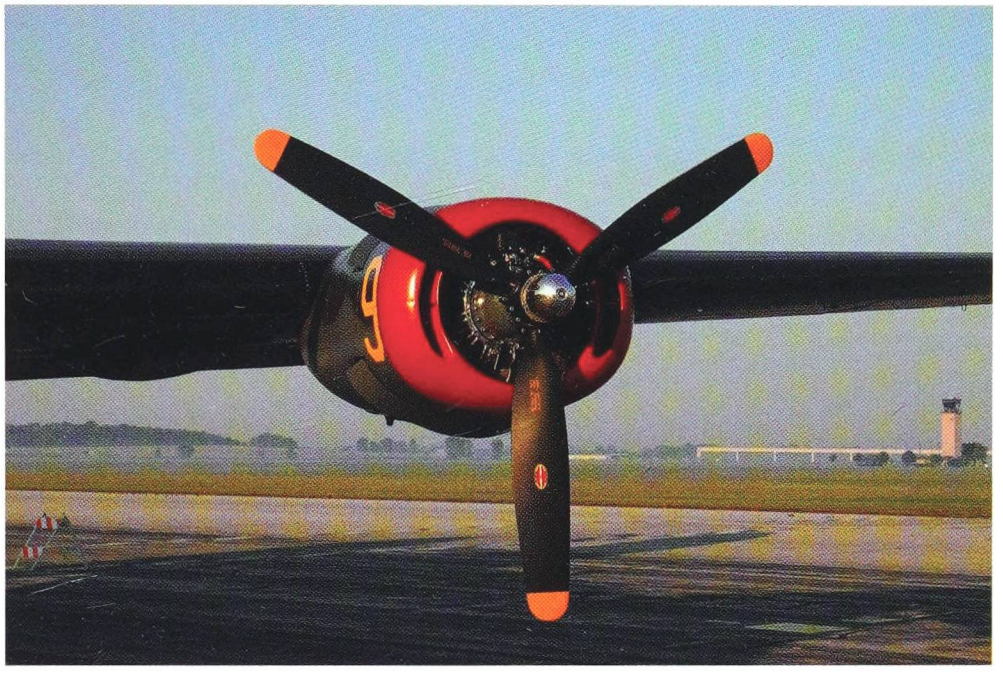
The round part of the landing-gear bay accommodates the main wheel when it is retracted. When the wheel rests in the bay, it is exposed, but fairings or doors attached to the main strut cover the part of the bay to the right in this photo. This view faces forward.

The left main landing-gear wheel and tire are observed facing outboard and forward. The Type 111 wheels were equipped with duplex expander-tube brakes. The flexible brake line emerges from the hollow axle and is attached to a fitting above the axle.

The two left engine nacelles on "Witchcraft" are displayed. The pilot controlled the cowl flaps, shown open, in a manner to optimize engine cooling. Above the outboard engine cowl atop the fuselage is a "football" radio-direction-finding (RDF) antenna.



The propeller tips were painted yellow to make them more visible to crewmen working around them on the ground when the engines were running. The oval-shaped Hamilton Standard decals on the blades were present on the propellers during World War II.



The engines were referred to by numbers, left to right, so this one, the outboard left engine, was engine 1. The crescent-shaped cowl cheek scoops channeled cooling air to several systems: the oil coolers, turbosuperchargers, intercoolers, and engine.

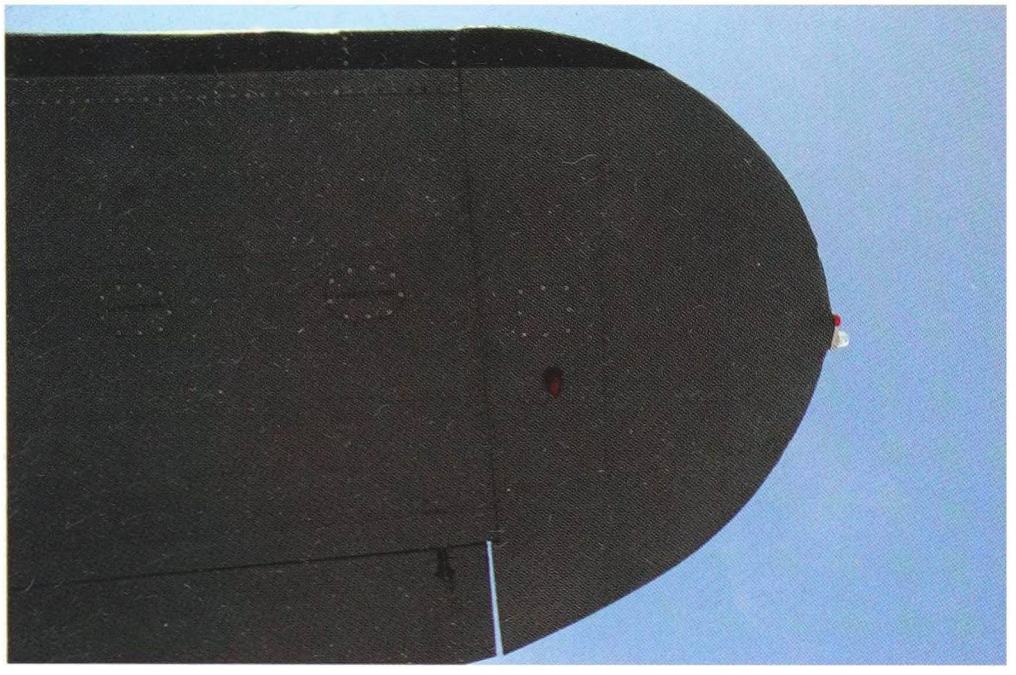
The dome-shaped gray assembly on the engine, to the rear of the propeller hub, is the reduction-gear housing. The reduction gear is epicyclic, or planetary, with a ratio of 2:3. A black data plate is affixed near the bottom of the reduction-gear housing.

The nacelle and propeller for engine 1 on "Witchcraft" is observed facing outboard. On the leading edge of the wing is a black deicer boot, for preventing ice buildup that could cause the aircraft to lose control during flight. The wheel well is visible to the left.

Recessed underneath the nacelle of engine 1 are elements of the General Electric B-22 turbosupercharger. The exhaust line coming from the right is fastened to the turbine assembly toward the left, protruding from the rear of which is the exhaust waste gate.

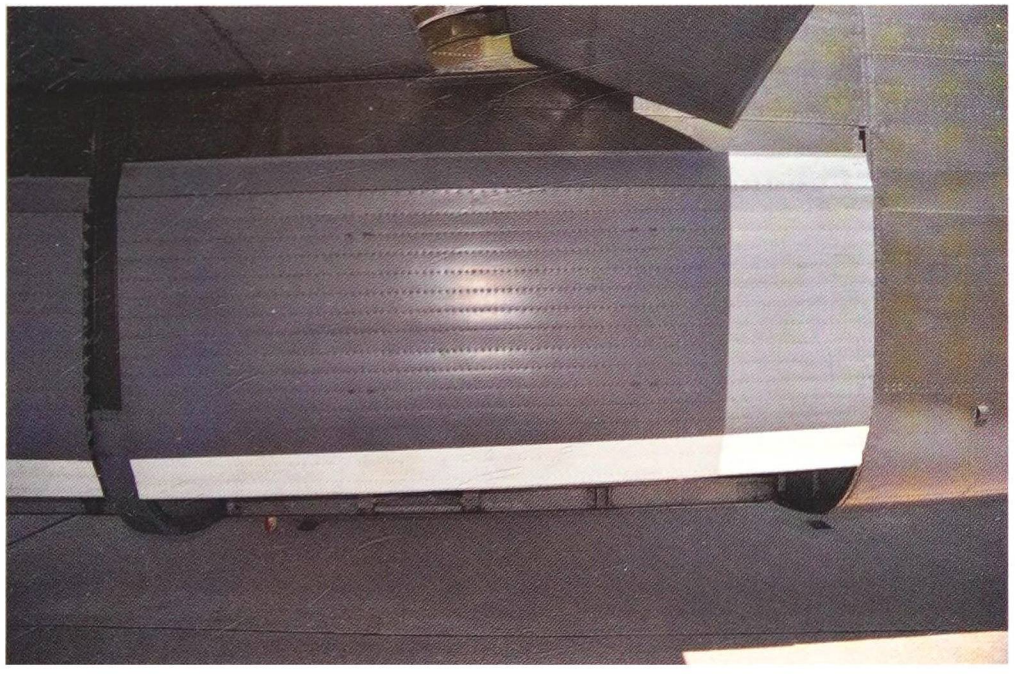
The turbosupercharger for engine 1 on "Witchcraft" is viewed from aft. Heat and pressure from engine exhaust gases propelled the turbine to compress air, which is directed to the engine intake manifold, providing the engine with more oxygen to burn.

The underside of the left wing is observed facing outboard from the nacelle for engine two (*top right*). To the rear of the landing-gear bay is a fairing that facilitated smoother airflow over the wheel when it was retracted. To the left is a partially extended flap.



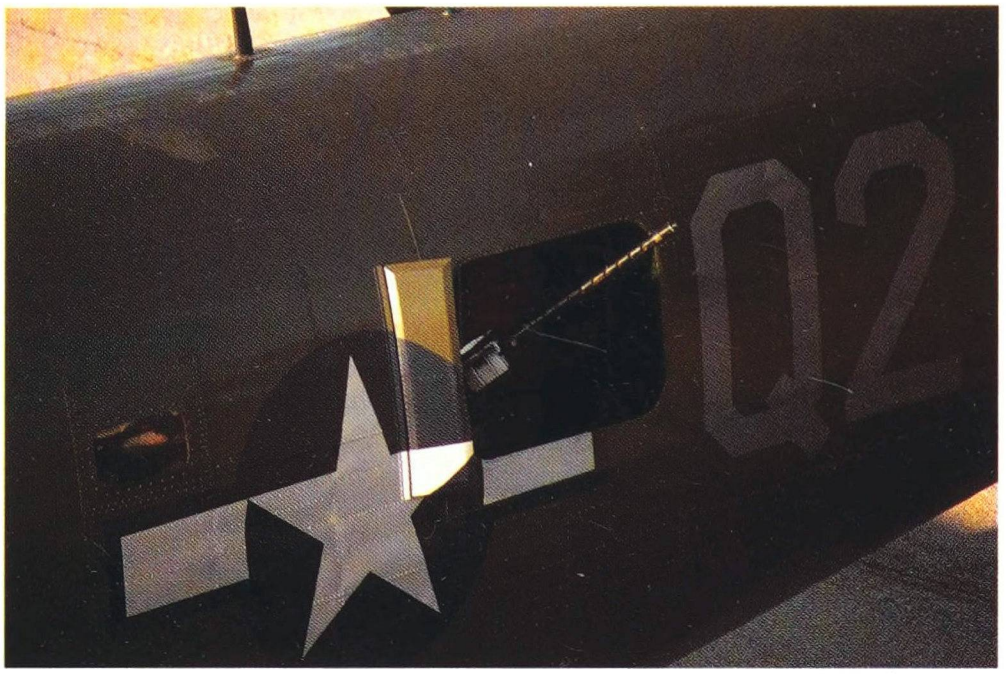
The original red navigation light, teardrop in shape, is present on the bottom of the wing near the left wingtip. A similar navigation light was on top of the wing near the wingtip. On the wingtip is a postwar navigation light with a red element and a clear strobe light.

The left side of the fuselage of "Witchcraft" is displayed from the rear of the wing to the waist window. Two mast antennas and a radio-direction-finding (RDF) football antenna are on the top deck. An escape hatch is between the forward mast and the RDF antenna.

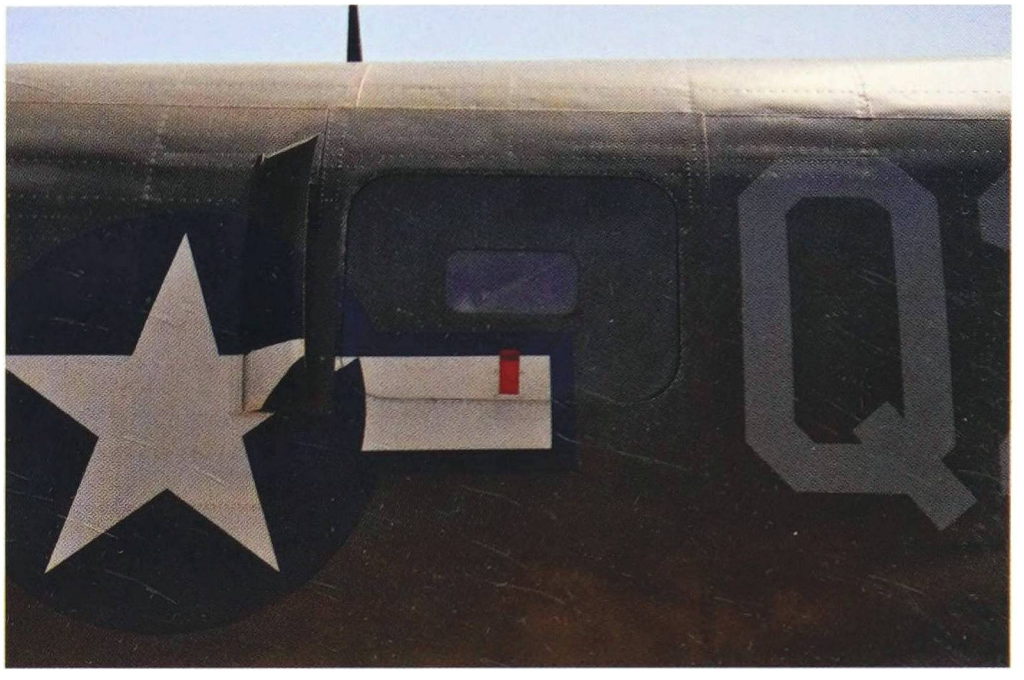


The bomb bay doors were flexible assemblies composed of an Alclad outer skin riveted and spot welded to a corrugated inner skin of 24ST Alclad. Curved tracks on the fuselage guided the doors during operation, and they were operated by the main hydraulic system. *Chris Hughes*

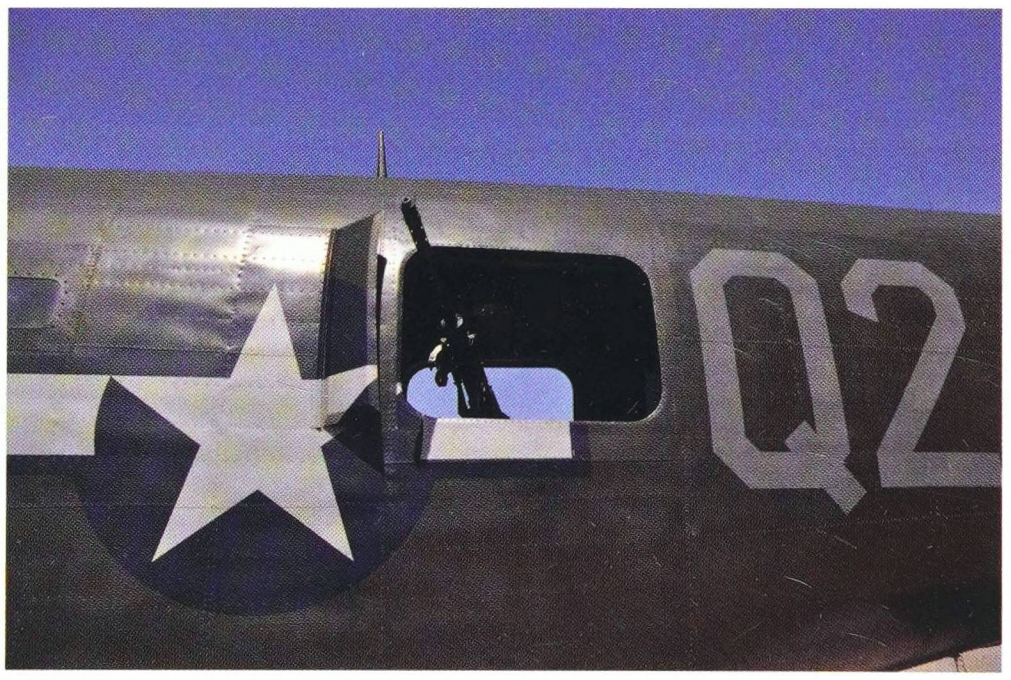
The escape hatch was used by the crew to escape from the plane after emergency landings or ditchings. For bailing out in flight, the crew exited through the nose landing-gear bay, the bomb bay, or a hatch on the bottom of the aft part of the fuselage.



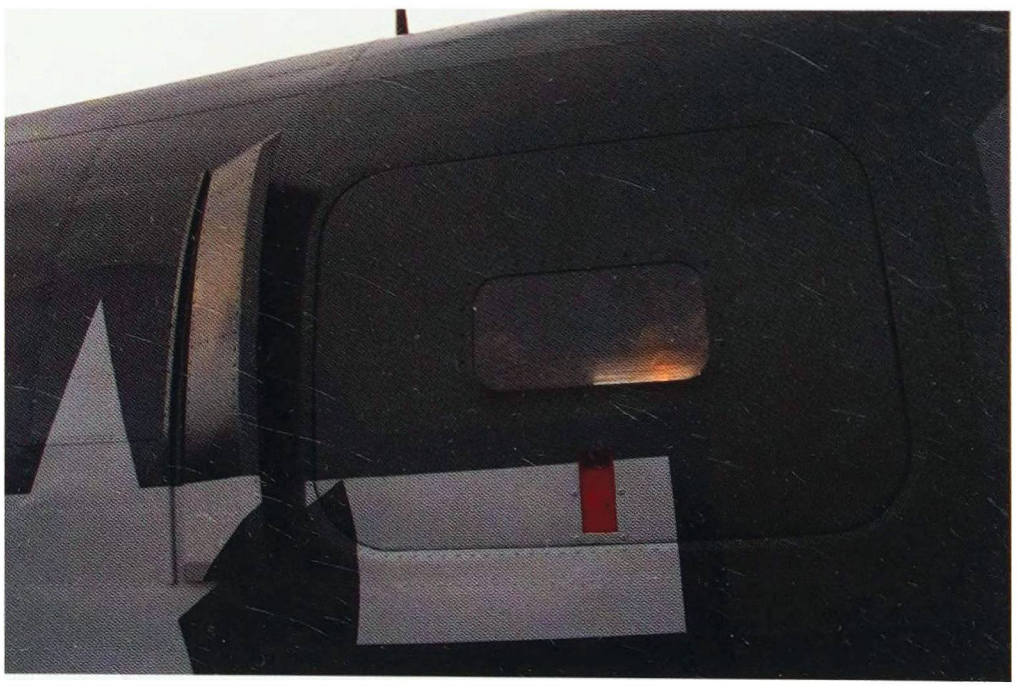
A small, fixed window (*left*) is forward of the left waist .50-caliber machine gun window. The rectangular panel to the front of the waist machine gun window is an air deflector, which reduced air turbulence that could interfere with the operation of the gun.



The left waist window is closed. It comprises an aluminum panel with a window in the center. The waist windows were hinged at the top. To open them, the bottoms were swung inward and secured in a stored position overhead in the waist compartment. *Chris Hughes*

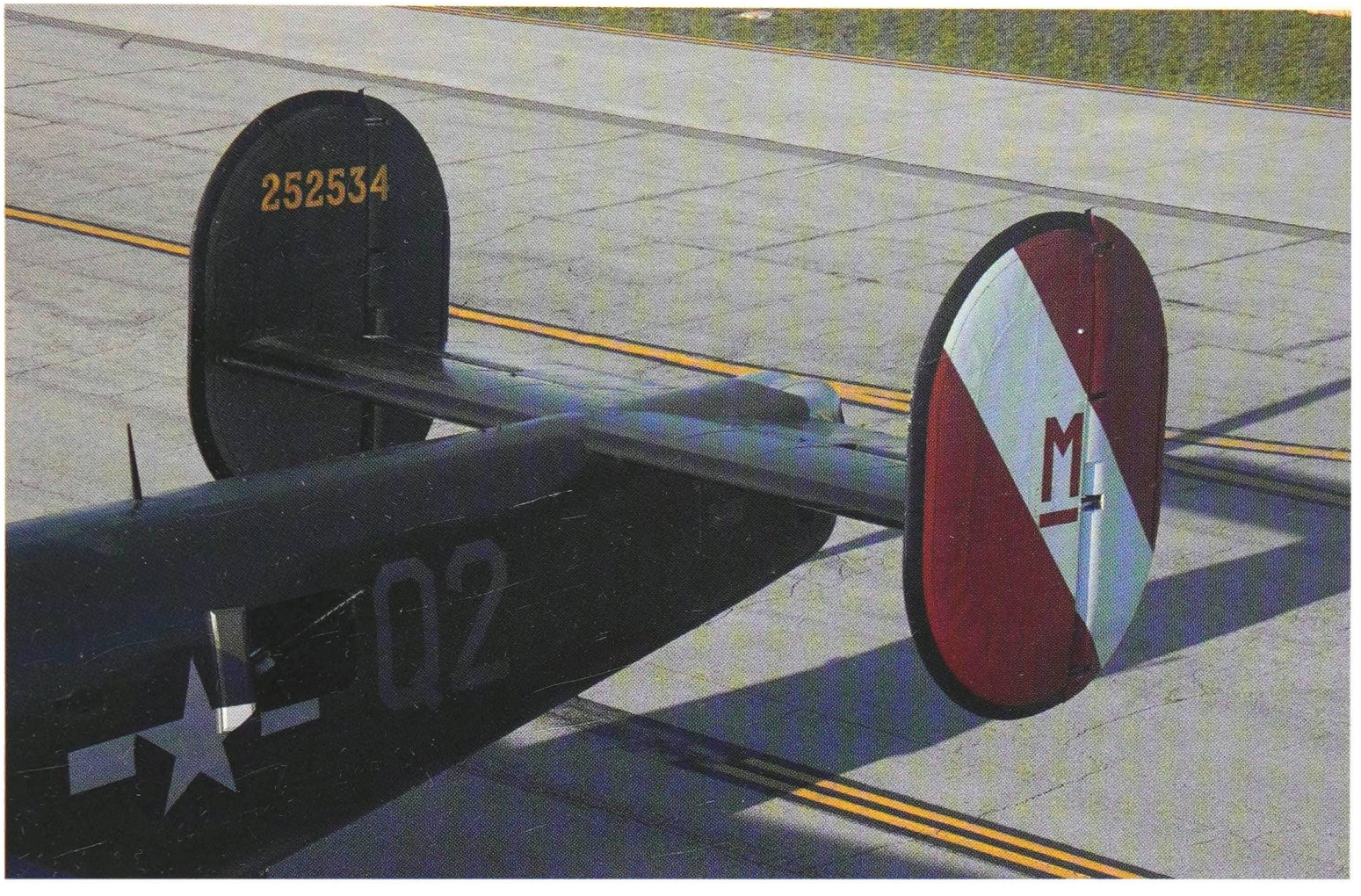


The waist windows on the B-24J-85-CF that replicates "Witchcraft" are of the opening type, with the left and right windows in line with each other. Many B-24Js were fitted with staggered, fixed waist windows with cutouts for mounting the machine guns. *Chris Hughes*

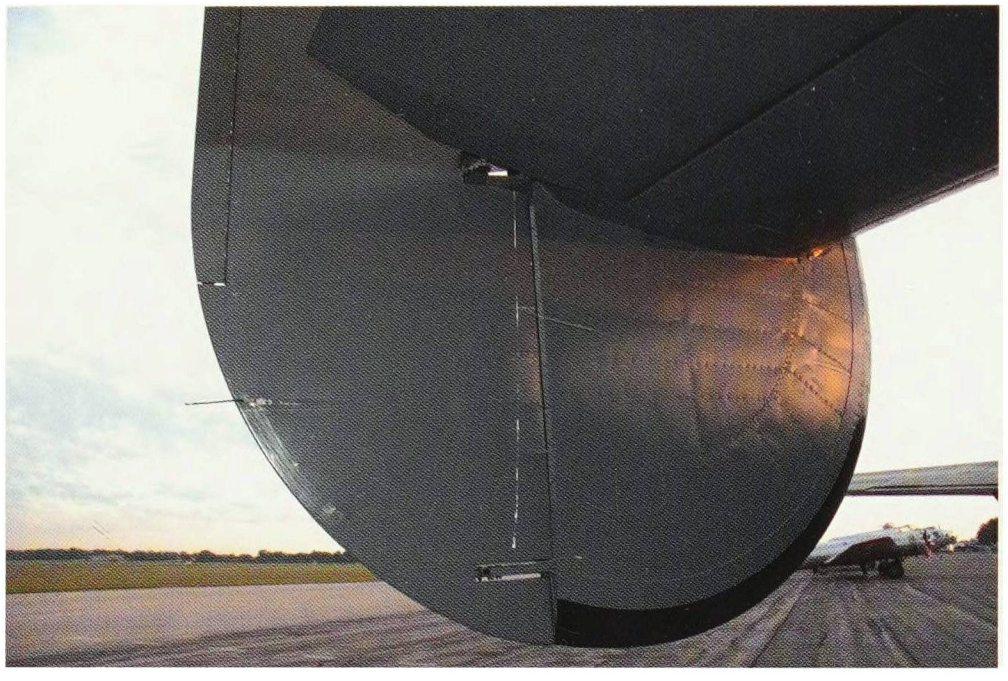


Toward the bottom of the waist window is a red-painted external latch release. In addition to reducing wind turbulence that could affect the waist gunner's aim, the air deflector helped keep air from rushing into the aircraft when the window was in the open position.

The empennage, as the tail assembly is referred to, of "Witchcraft" is displayed. Each of the vertical tails attached to the horizontal stabilizer incorporates a vertical fin and a rudder. At the rear of each side of the horizontal stabilizer is an elevator. Matte black deicer boots are on the leading edges of the vertical fins and the horizontal stabilizers. At the rear of the fuselage, part of the clear dome of the tail turret is in view.

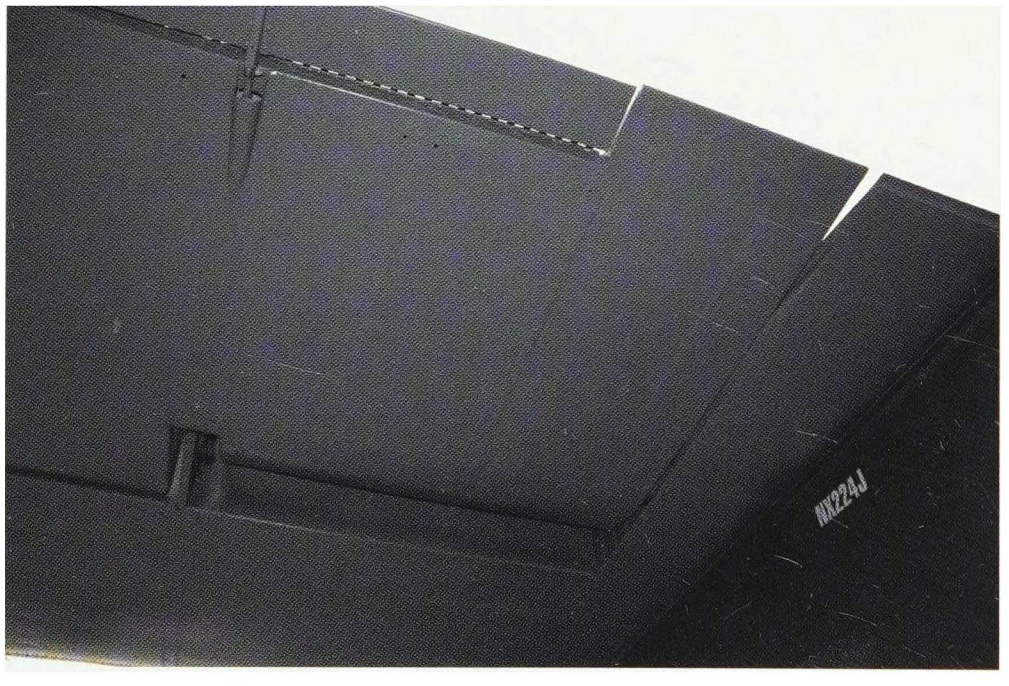


The rudders had a movement range of 20 degrees to the left and right of center. Each rudder had an aluminum frame comprising a torque box and ribs, with fabric stretched over it. An aluminum-alloy trim tab is centered on the trailing edge of the rudder.



The center and bottom hinge of the left rudder are visible. The vertical fins featured a novel manner of forming the skin. Aluminum-alloy sheets in a fan arrangement were fastened to the leading edge of the fin and to a curved spar within the frame of the fin.

The joint between the horizontal stabilizer (*top left*) and the left side of the fuselage is illustrated. For ease of replacement, there were only four attachment points of the horizontal stabilizer to the fuselage. To the far right is the tail turret assembly.



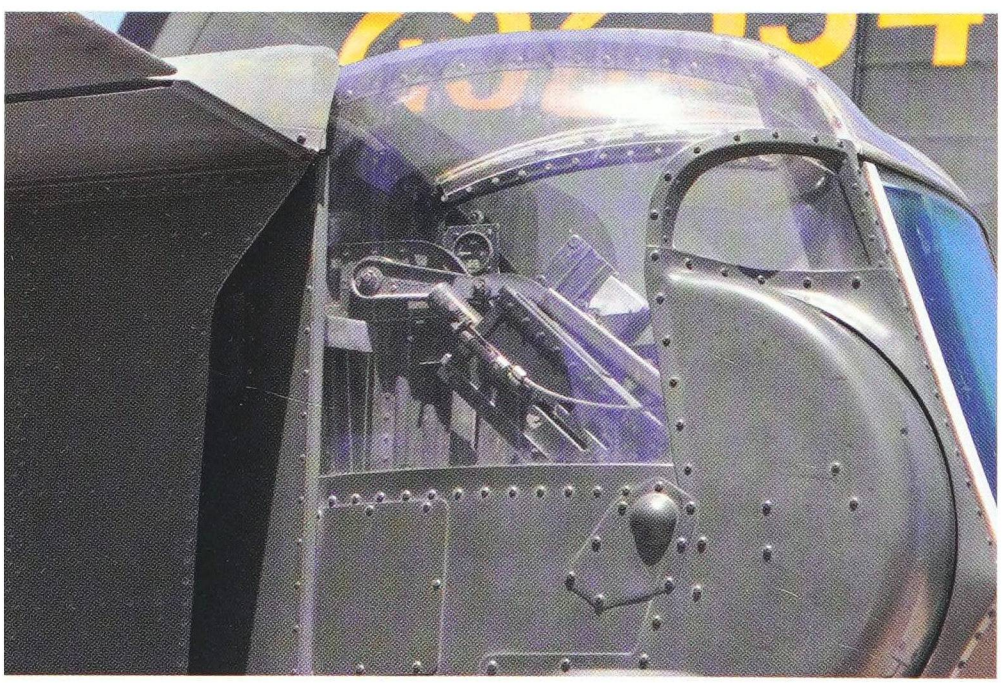
The underside of the left elevator is viewed. Unlike the outboard edge of the elevator, with its angled design, the inboard edge is perpendicular to the leading and trailing edges. The trim tab on the elevator is visible. To the right is the plane's civil registration number.

Below the horizontal stabilizer is a small window. A yellow stencil on the window frame reads "CUT HERE FOR RESCUE." A ground crew could cut the aluminum skin within the L-shaped corner markings to effect the rescue of crewmen trapped in the plane. *Chris Hughes*

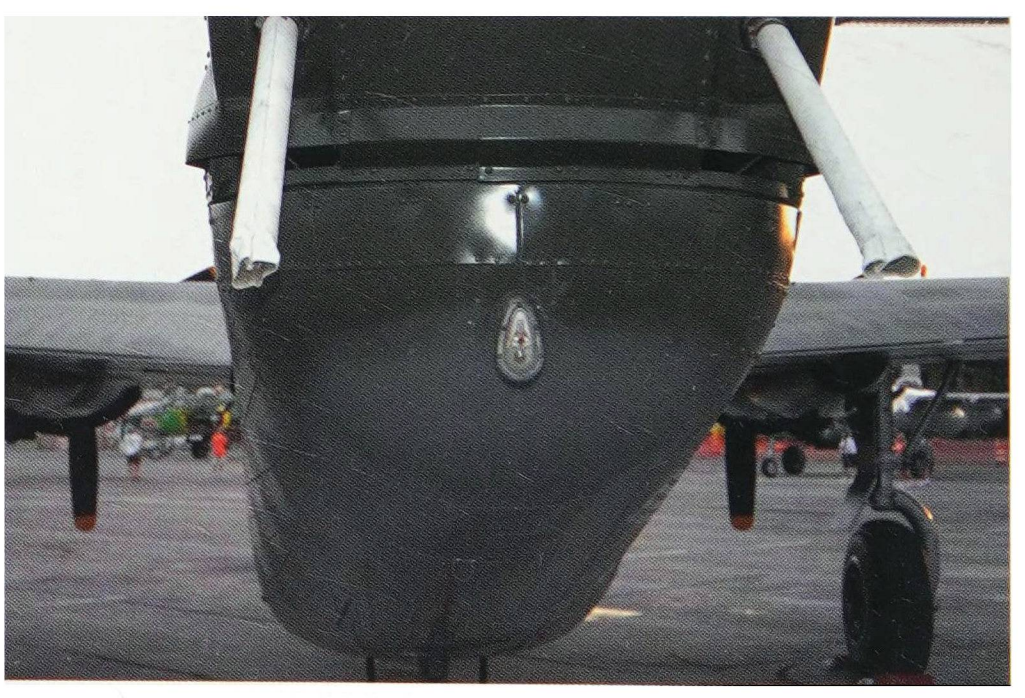
Unlike the Emerson A-15 turret, whose dome had a nearly vertical front, the A-6 family had a clear panel on the front of the dome that sloped forward toward the bottom, and an armor plate below the clear panel that sloped toward the rear toward the bottom. *Chris Hughes*

The tail turret is the Consolidated A-6B, armed with two Browning M2 .50-caliber machine guns, shown in a lowered position. As was the case with the Emerson nose turret, the gunner controlled the operation of the turret from inside the enclosure.

The front clear panel of the tail turret of "Witchcraft" is observed close-up. Mounted on a yoke inside the clear panel is the gunsight. Several different types of optical gunsights were used in the A-6 series of turrets, including the N-3A and the N-6 models. *Chris Hughes*



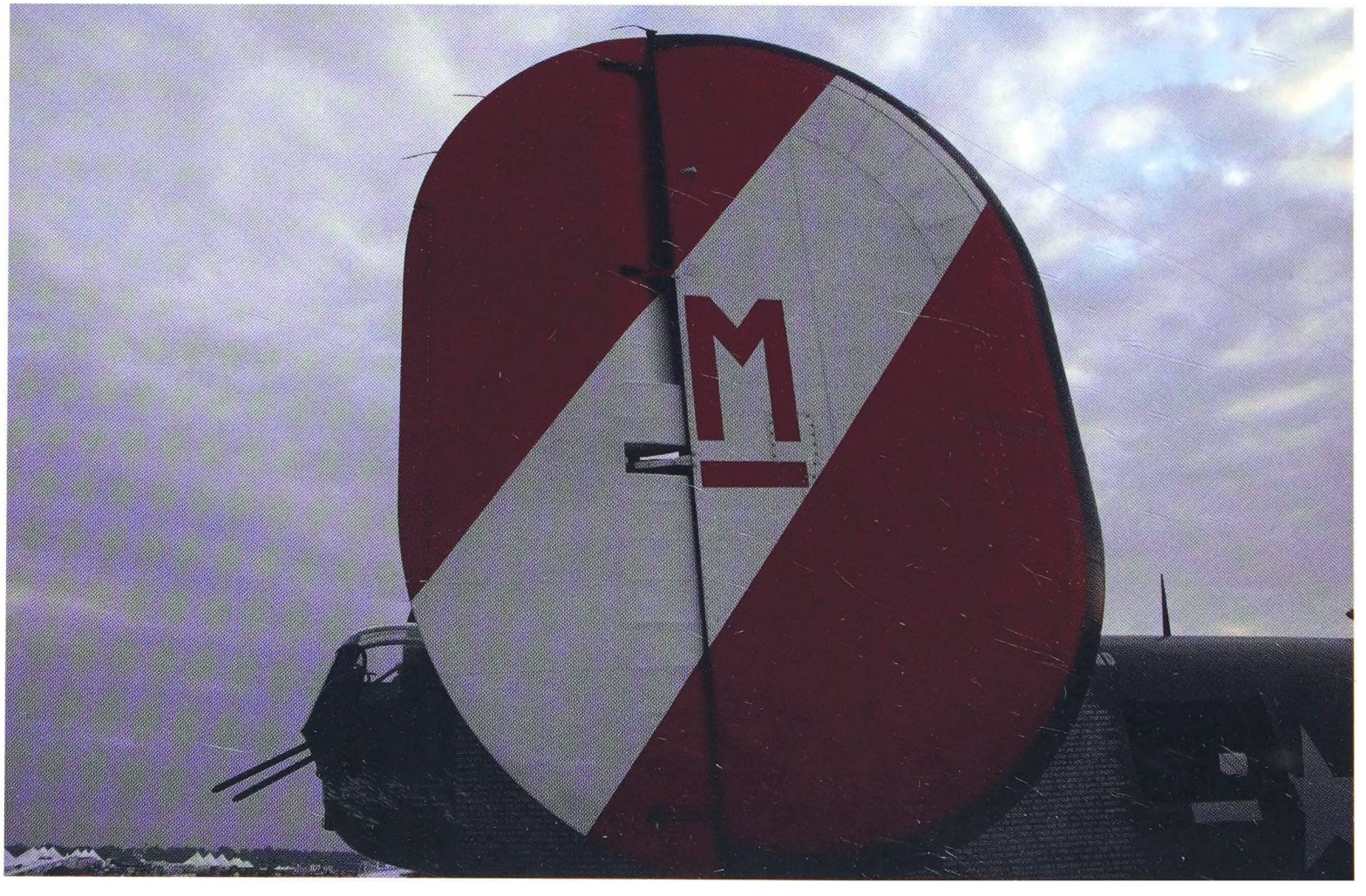
Inside the tail turret dome is the receiver of the right .50-caliber machine gun, above the rear of which is a pressure gauge for an oxygen bottle. The A-6B had considerably better visibility to the side than the A-6 and A-6A turrets that also were used on B-24s. *Chris Hughes*



At the rear of the fuselage of "Witchcraft" is a formation light with a clear, teardrop-shaped lens. Canvas covers are fitted over the cooling sleeves of the .50-caliber machine guns. These sleeves are bare metal and subject to corrosion, so it is important to protect them.

The right side of Consolidated B-24J-85-CF Liberator, serial number 44-44052, is on display in an in-flight photograph during the period when this bomber, now in markings to replicate "Witchcraft," was painted to replicate "The Dragon and His Tail." The right main landing gear wheel is visible below the wing, and the flaps are in a partially open position. During World War II, at one point the original "The Dragon and His Tail" was based with the 43rd Bombardment Group on Ie Shima. *Rich Kolasa*

In her more recent guise as "Witchcraft," the same B-24J-85-CF seen in the preceding photograph is parked on an airport hardstand. The light-colored areas toward the rear of the fuselage and along the forward end of the fuselage are the names of major sponsors.



The fan-shaped arrangement of skin panels on the vertical fin is visible in the upper part of the diagonal white stripe. Cutouts in the leading edge of the rudder provide clearance for the hinges and the horn. The trim tab at the rear of the rudder is barely visible.

Near the top of the right vertical tail of the replica of "Witchcraft" is the tail number that was assigned to the original "Witchcraft." The horizontal stabilizer, to which the vertical tail is attached, had a setting of 2.5 degrees relative to the longitudinal axis of the plane. *Chris Hughes*

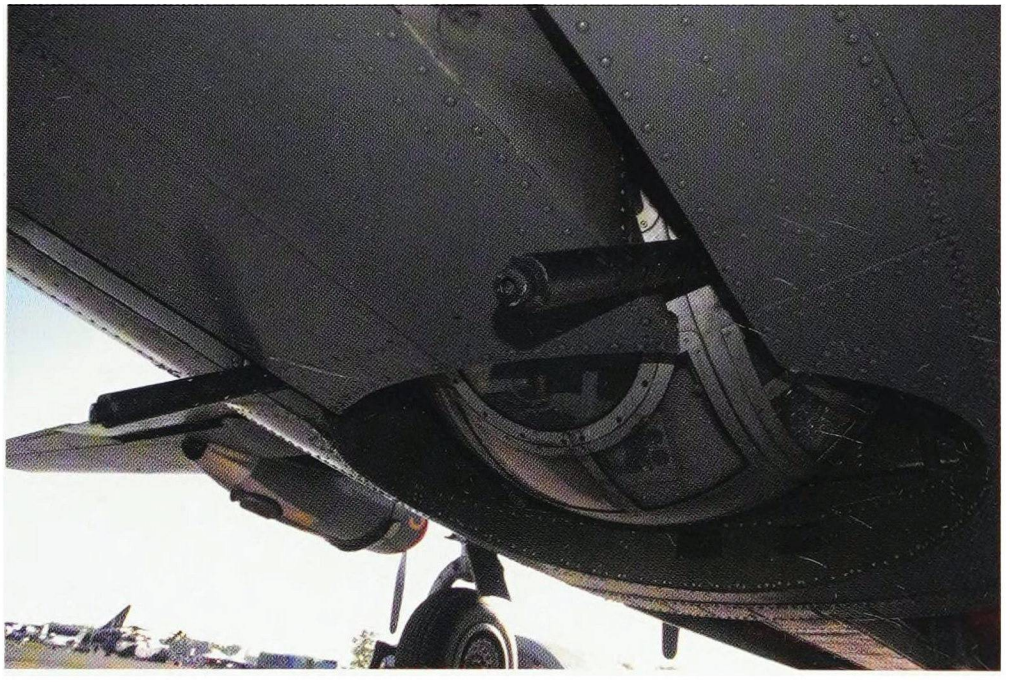
A .50-caliber machine gun protrudes through the right waist window of "Witchcraft." Near the muzzle is a bead sight. Silhouetted in the opposite window is the carriage for the left waist machine gun; it is a pintle-type mount on top of a stanchion-type stand.

On the underside of the fuselage between the waist machine gun station and the tail turret is an escape hatch with an inset window. This was the hatch through which crewmen in the aft part of the plane would bail out. To the lower right is the extended tail skid.

The inner surface of the air deflector forward of the right waist window is in view. Slots for the three actuators for the air deflector are cut into the fuselage skin. The air deflectors would be closed when the waist windows were closed, to reduce drag.

During B-24D production, a retractable Sperry ball turret was installed in the bellies of Liberators. This turret replaced several preceding belly-mounted defensive suites, including a single, tunnel-mounted machine gun and a remote-control turret.

The ball-turret gunner entered the turret once the plane was aloft, and exited it before landing. He sat in the turret in what was close to a fetal position and sighted his Browning M2 .50-caliber guns through the circular, optically flat window to the front of the turret.

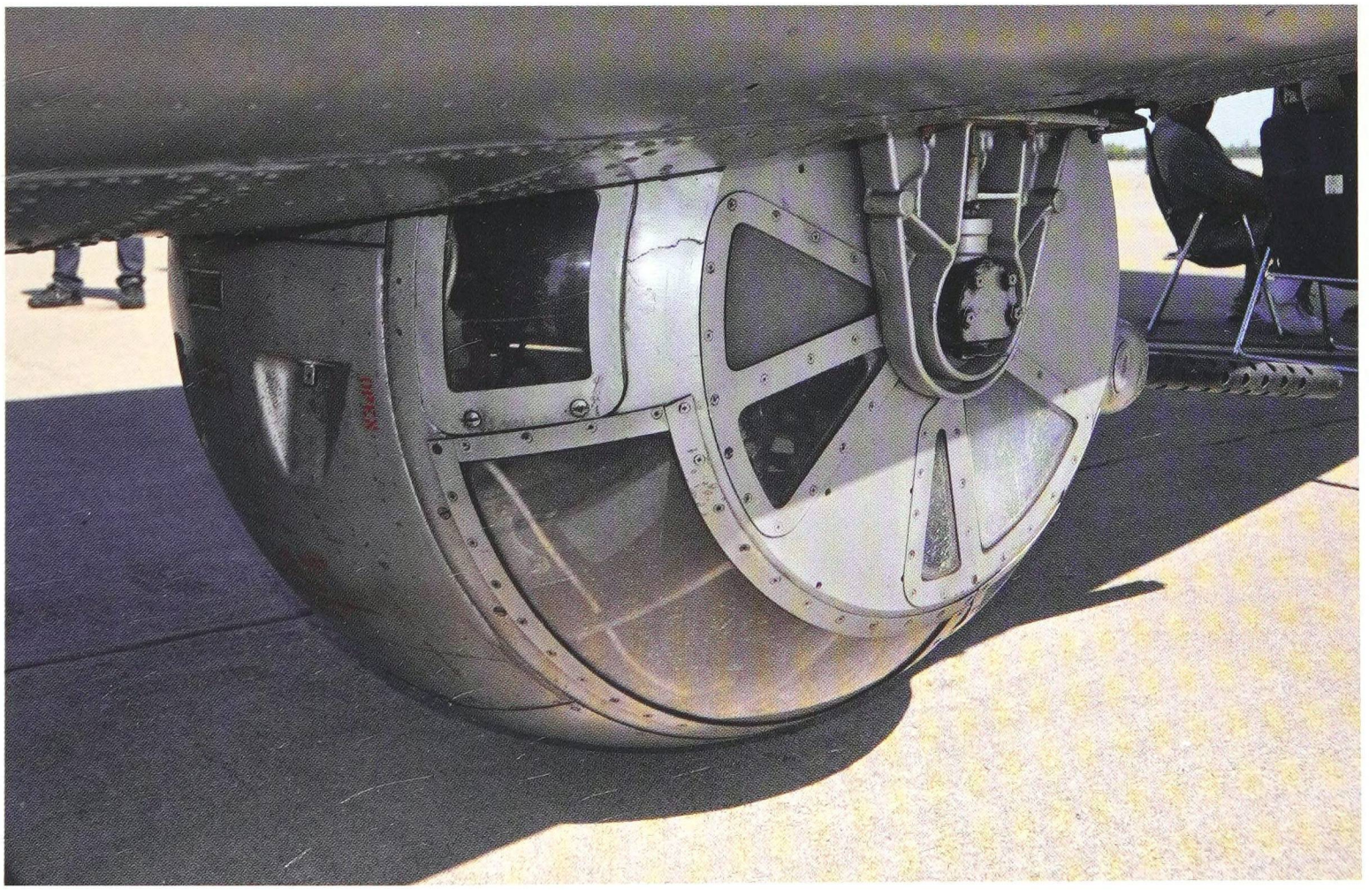


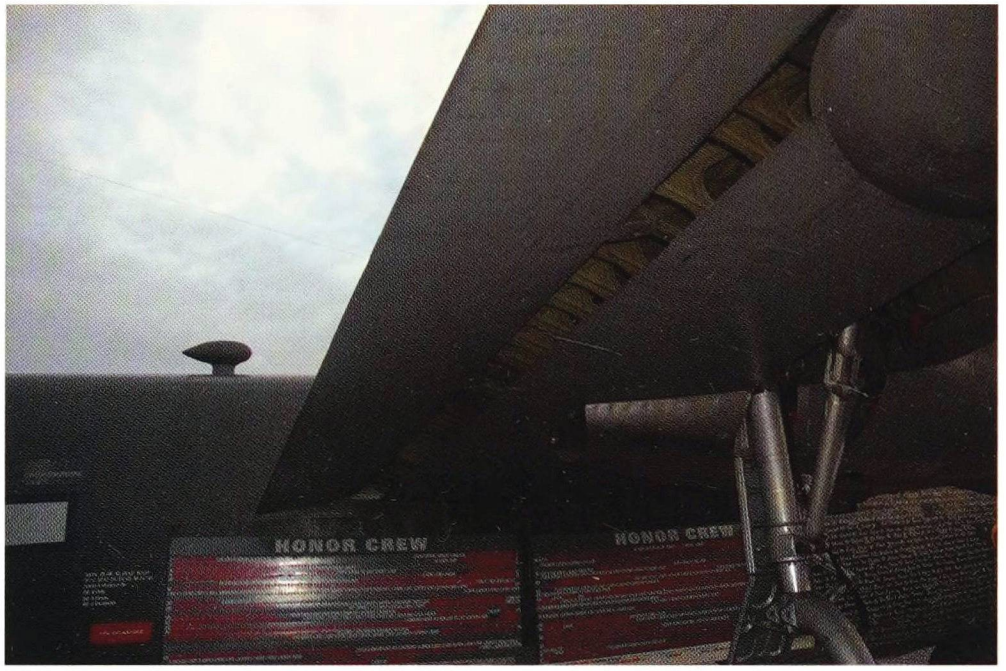
Because of the low ground clearance of the belly of the B-24, it was necessary to make the ball turret retractable when the plane was on the ground. The ball housing is hoisted into a circular well in the belly, and the machine gun barrels fit into two recessed slots.

This turret is an early version with a glazed fairing (visible at the top left of the photo) attached to each side of the central housing assembly, giving the turret an entirely spherical appearance. At the top of the photo is a rectangular spent-cartridge ejector port.

This ball turret, shown in its lowered position, represents a later model than the one in the preceding photos. It lacked the glazed side fairings, which gave the earlier model a spherical look. It also had a different arrangement of windows and spent-cartridge ejector ports. *Chris Hughes*

The ball turret is suspended from a trunnion on each side; the left one is on the side of the turret housing. The entire turret swiveled on the trunnions to effect the elevation and depression of the machine guns. To the rear of the turret (*left*) is the gunner's access door. *Chris Hughes*





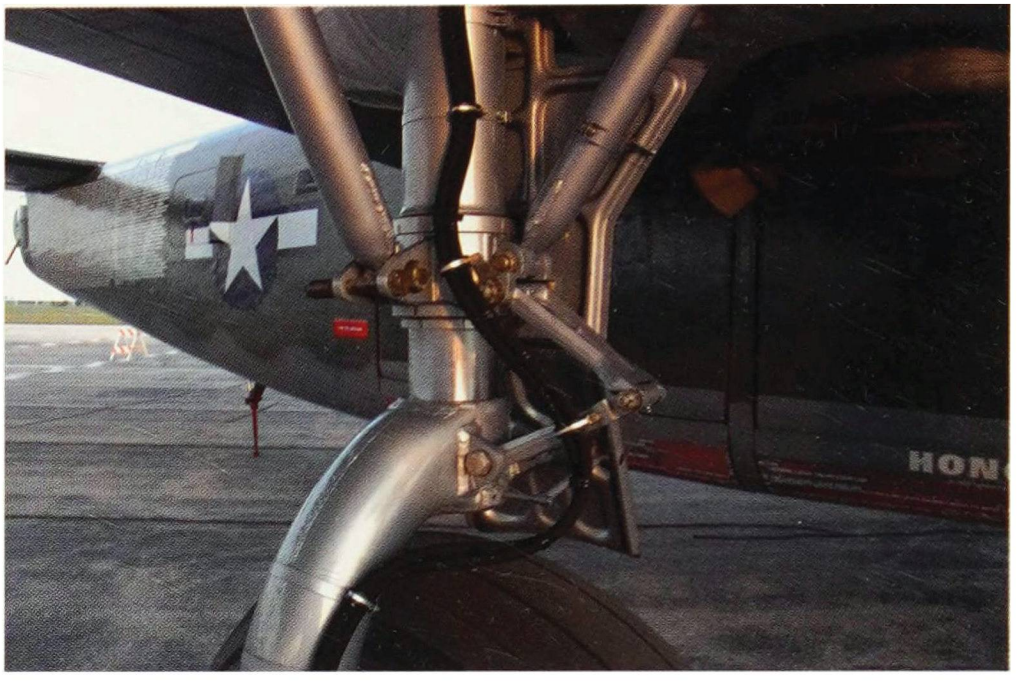
B-24s were equipped with Fowler-type flaps, partially extended here. They were hydraulically powered and constructed of aluminum-alloy frames and Alclad skin. When deployed, the flaps swung downward and also moved rearward via rollers on five tracks.

The inner surface of the trailing edge of the right wing is visible through the gap created when the flap is partially lowered. The flaps had a total area of 144.4 square feet and had an angle of 40 degrees below horizontal when they were fully lowered.

The right main landing gear of "Witchcraft" is observed facing toward the fuselage. It and the bay it is stored in when retracted are the mirror image of the same elements on the left side of the aircraft. In the background, names of the aircraft's honor crew are emblazoned on the bomb bay doors; more names of sponsors are painted on the fuselage to the front of the bomb bay doors.

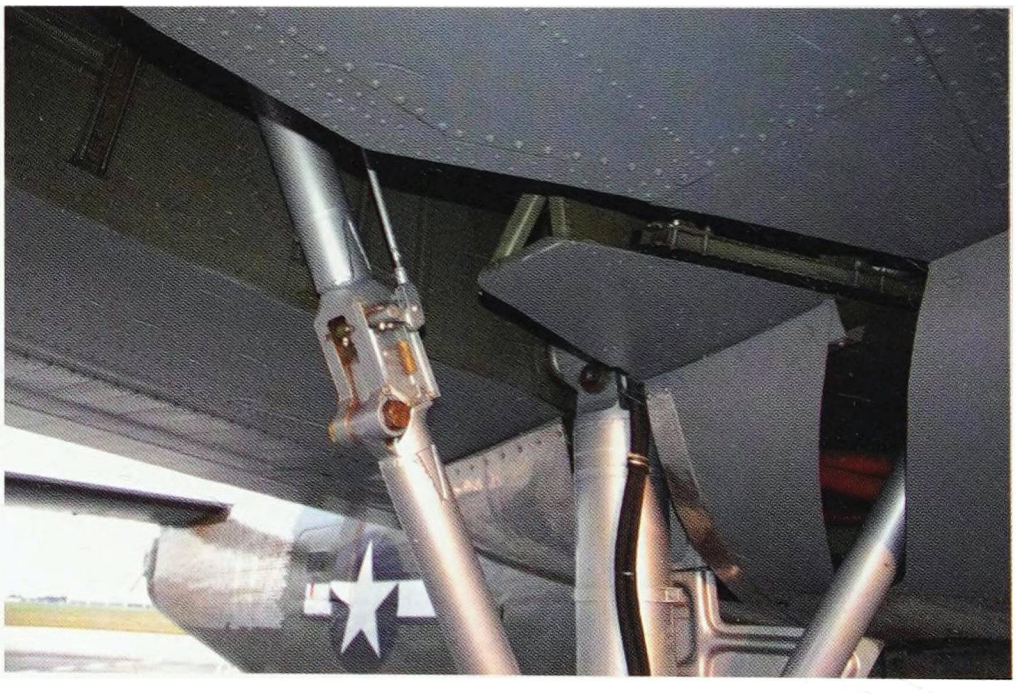
The drag brace extending diagonally to the front of the oleo strut is secured at the top within the engine nacelle, and a slot in the nacelle provided room for the brace to move when the landing gear was retracted or lowered. The right landing light is on the wing.

The oleo strut of the B-24J's main landing gear is perpendicular to the ground. At the bottom of the oleo strut is the single fork. Fairings on the inboard side of the oleo strut form a door over part of the landing-gear bay when the landing gear is retracted.



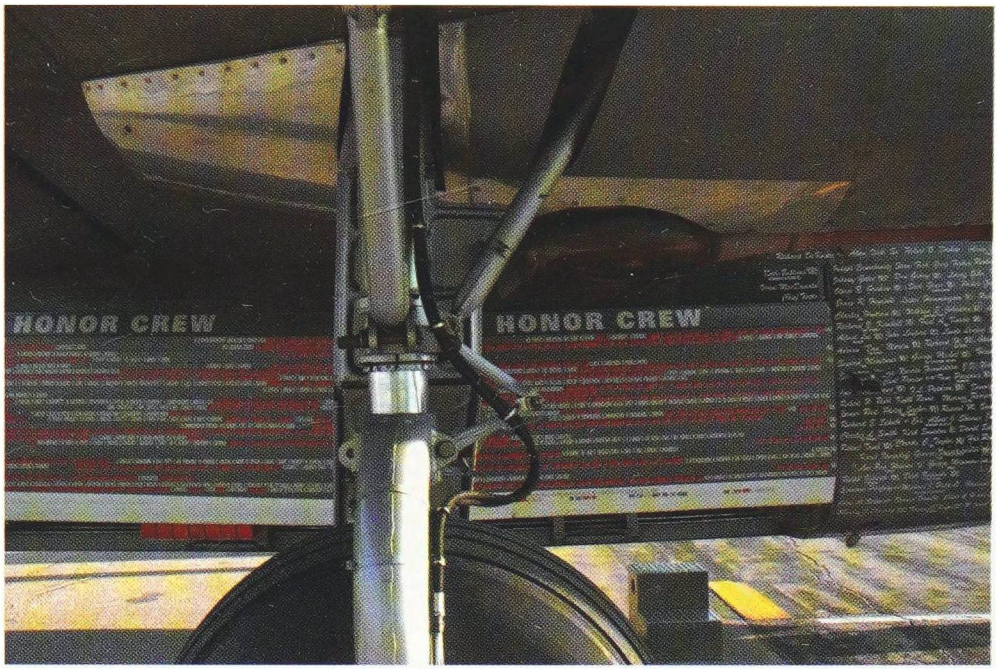
Details of the right main landing gear above the single fork are displayed. To the front of the oleo strut is the torsion link assembly. Flexible black brake lines are fastened to the strut. The inner surfaces of the landing-gear fairings are embossed for extra strength.

Like the drag brace at the front of the main landing gear, the top of the oleo strut of the main gear is on a pivoting mount recessed in the engine nacelle. A cutout in the nacelle allows clearance space for the strut to pivot when the main landing gear is operated.

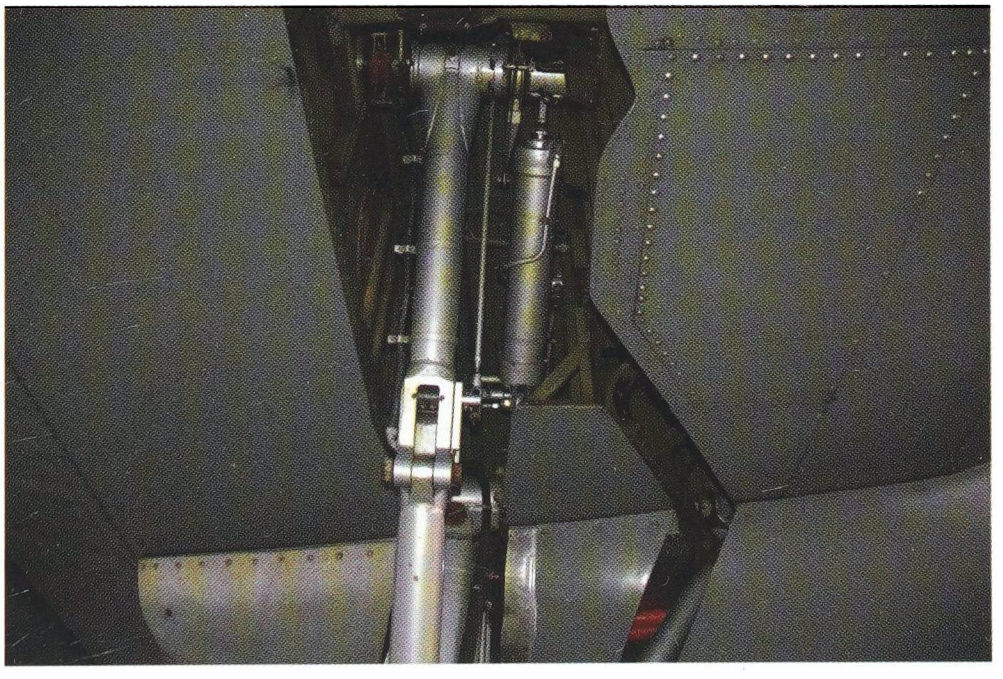


In the middle of the lower side brace of the right main landing gear (*left of center*) is a latch, with a latch-release arm running from it up into the wing. The latch was released when the main gear was retracted, allowing the side brace to fold at the latch.

Toward the lower right, cutouts in the wing and the engine nacelle to accommodate the movement of the drag brace to the front of the oleo strut of the right main landing gear can be seen. To the left of that feature in the photograph, the knuckle and latch on the side brace are shown from the side. Up in the landing-gear bay is the hydraulic cylinder that actuates the retraction and the lowering of the landing gear.



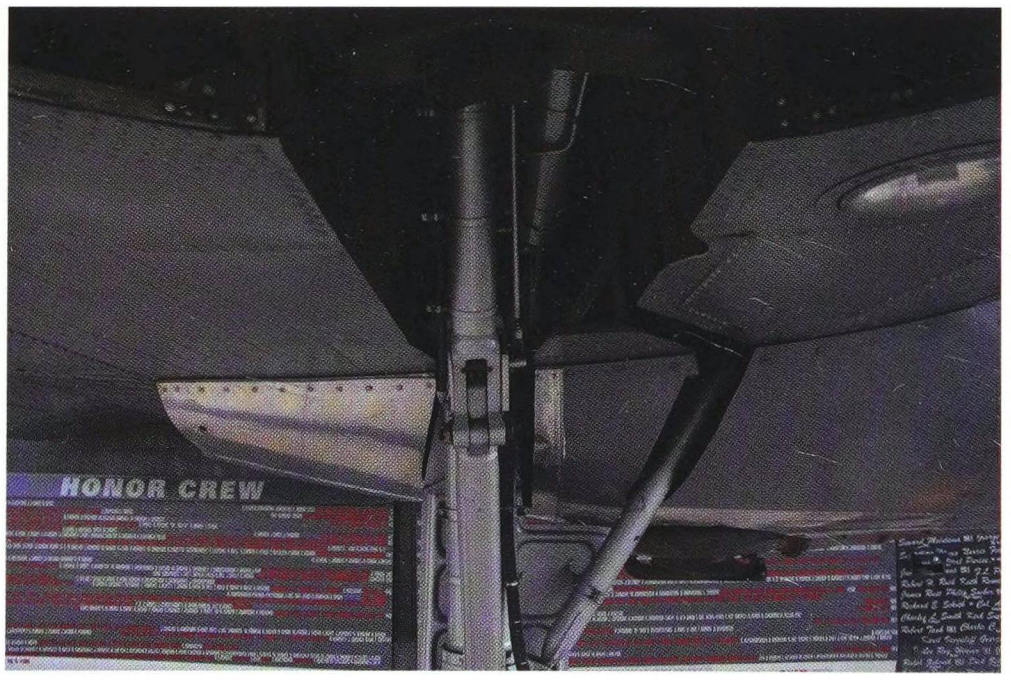
The shiny metal piston of the oleo strut is viewed close-up. The piston passes up through the inside of the cylindrical oleo strut and acts against the oil and air in the upper part of the oleo strut to buffer the ride when the aircraft taxis over a bumpy runway or lands.



The lower side brace (*foreground*) and oleo strut form a strong, triangular shape when the landing gear is lowered. When the latch on the brace, below the center of the photo, is unlatched, the brace can be folded or collapsed, allowing the landing gear to be retracted.

The point on the oleo strut where the bottom of the lower side brace, right, is attached is depicted, facing forward with the front end of the fuselage in the left background. Fastened to the inboard side of the oleo strut is one of the landing-gear fairings.

The right main landing-gear Type 111 wheel and its 56-inch, 16-ply tire are viewed facing inboard. Inside the wheel is a duplex expander-tube brake. The small, box-shaped fitting on the front of the fork above the towing eye is a bleeder valve for the brake lines.



The knuckle and latch of the lower side brace are at the center of the photo, looking inboard toward the right bomb bay doors. The thin rod alongside the lower side brace is the unlatching arm, which mechanically unlatches the knuckle at the center of the brace.

The fairing, or door, on the side of the oleo strut has a piano hinge between the sections and is fitted with rod-shaped links to the top of the fork. This construction allows the lower section of the fairing to flex and move with the up-and-down movement of the fork.

The angle of the lower section of the landing-gear fairing in relation to the upper section is apparent. When the plane takes off and the yoke extends down from the oleo strut, the lower section of the fairing also extends so it comes in alignment with the upper section.

The nacelle for engine 3, the inboard engine on the right wing, is viewed facing outboard. Below the nacelle are elements of the turbosupercharger for engine 3 and parts of the right landing gear and its fairing. To the left is an open cowl flap.

The main landing-gear wheel and tire of "Witchcraft" are observed facing outboard. A brake line emerges from the hollow axle and is attached to a fitting on the wheel. At the top, the lower section of the landing-gear fairing has a curved shape on its lower edge.

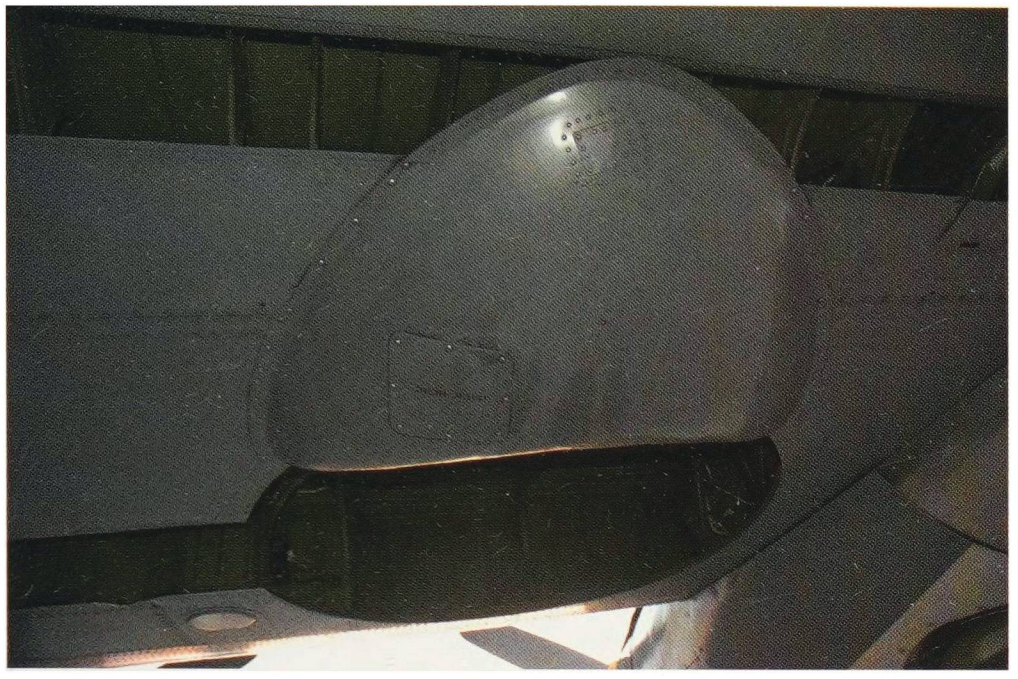
Below the nacelle containing engine 3 on the right side of "Witchcraft" are elements of the turbosupercharger system, including the exhaust line running from below the cowl to the left to the turbine assembly, on the rear of which is the exhaust waste gate.

A D-shaped opening is in the rear of the nacelle of engine 3. Fastened to the wing just aft of the opening is a jack pad, adjacent to which is stenciled "JACK HERE." To the lower right is part of the right main landing gear and landing-gear fairing.

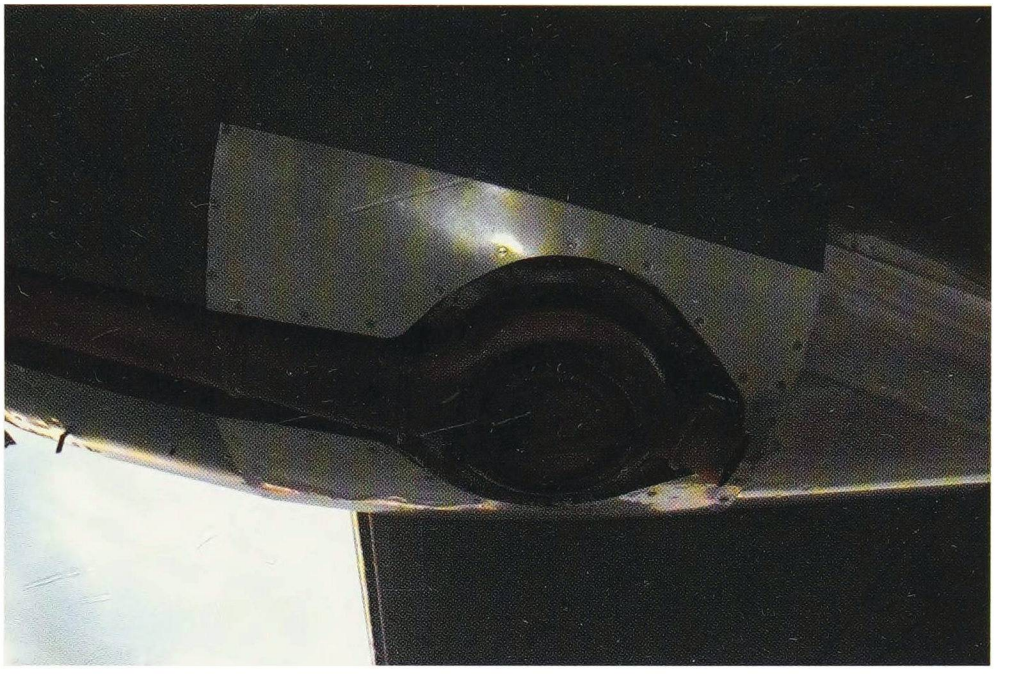
Running from the top of the photo to the bulkhead on the near side of the fire extinguisher bottle are two auxiliary spars that support the right main landing gear.

The interior of the right wheel well is viewed facing a forward and outboard angle, with the inboard side of the nacelle of engine 4 at the bottom of the photo. Between the wing bulkhead in the foreground and the next bulkhead is a red fire-extinguisher bottle.

Looking outboard from near the right side of the fuselage, the Fowler flap is partially extended. The fork-shaped objects on the leading edge of the flap are flap carriages; they are attached to tracks on the wing that allow the flaps to extend aft when lowered.

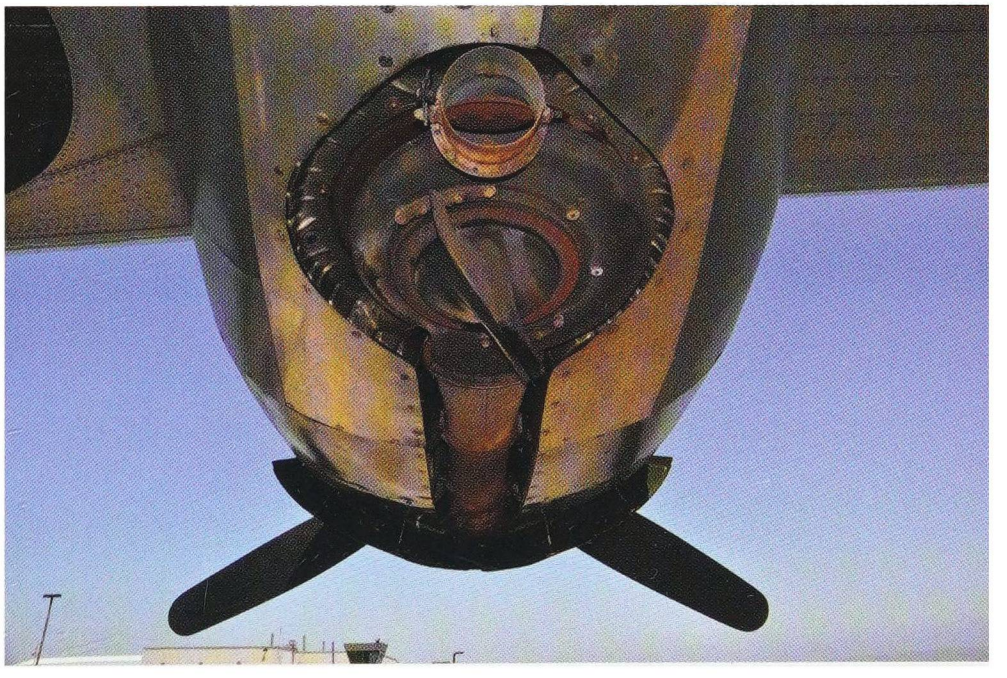


The right landing-gear bay is viewed facing upward and forward, with the flap to the top, the leading edge of the wing to the bottom, and the outboard nacelle to the right. On the semi-dome-shaped fairing at the center of the photo is an access cover for a jack pad.



Each engine of the Liberator was paired with a turbosupercharger. These units used engine exhaust to drive a turbine, which drove a turbo compressor, sending compressed air to the engine intake manifold. Turbosuperchargers gave the engines much better performance at high altitudes.

The outboard nacelle on the right wing, the front end of which holds engine 4, is observed from the rear, showing the D-shaped opening in the aft end of the nacelle.

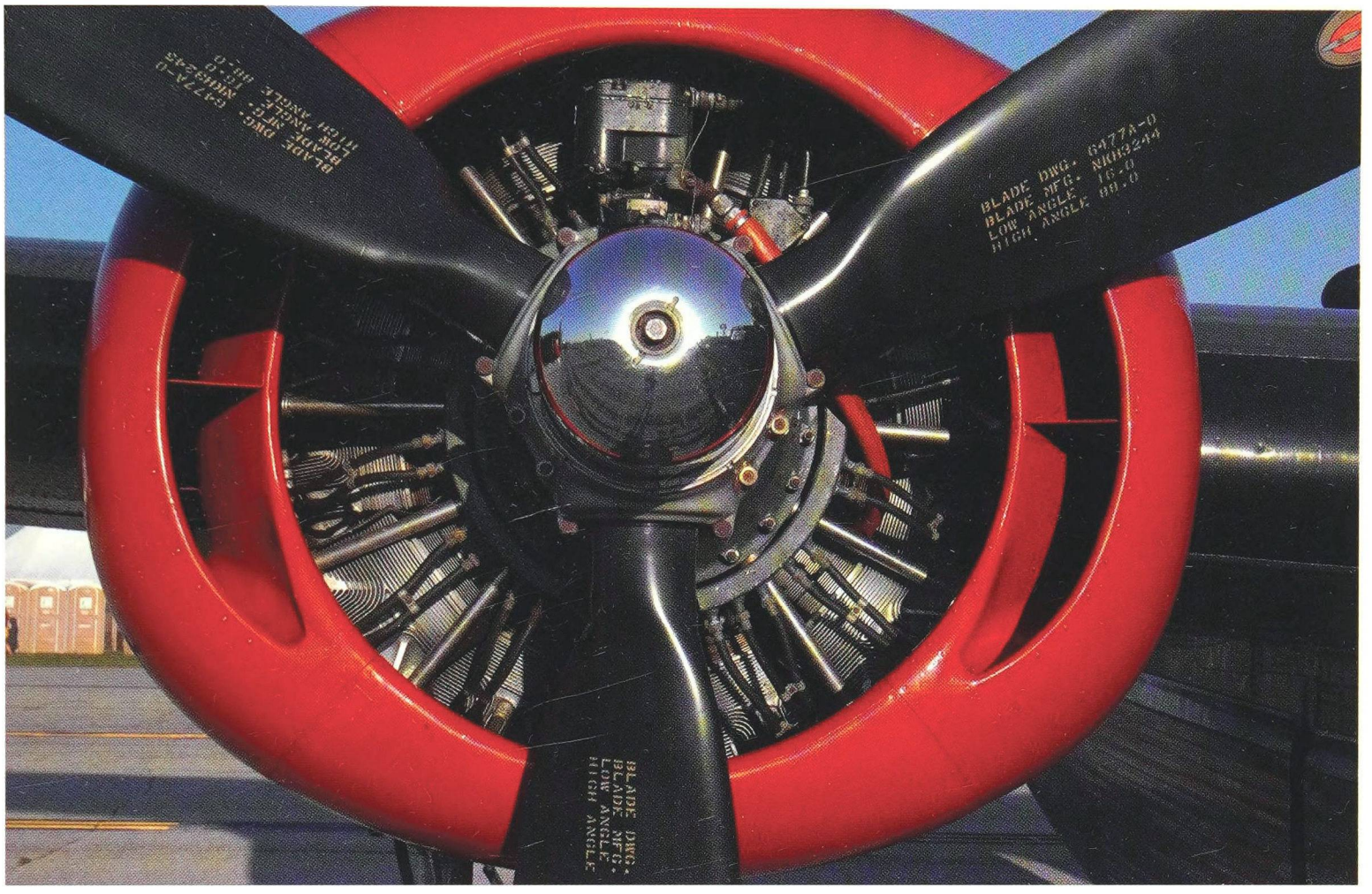


The exhaust pipe and the bottom of the turbosupercharger are situated in recesses in the bottom of the outboard right nacelle. Inside the exhaust waste gate is an open butterfly valve. The vane-shaped object on the turbosupercharger is part of the cooling cap. *Chris Hughes*

The front end of the exhaust line (*center*) is fastened to the bottom of the exhaust manifold, which is visible through the open cowl flaps. The cowl flaps are designed to overlap when opened, and they are opened and closed by means of the actuator rods.

The Pratt & Whitney R-1830-65 engine, such as engine 3 on "Witchcraft" here, had a bore and a stroke of 5.5 inches and a displacement of 1,829.4 cubic inches. These were highly dependable engines and were used on a number of other US military aircraft.

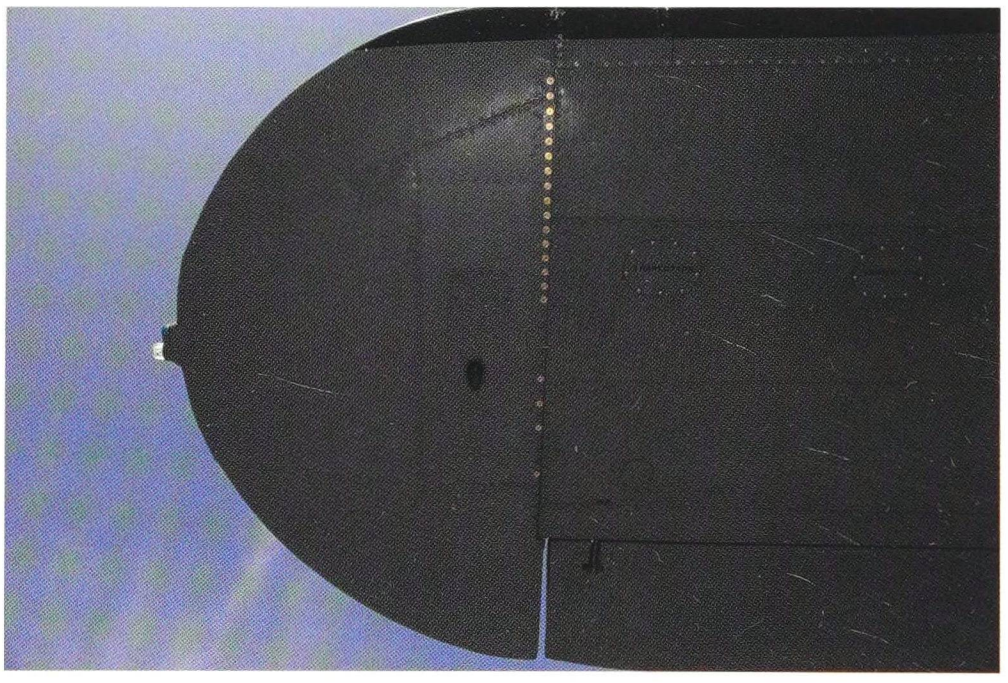
A close-up portrait of the front of engine 3 on "Witchcraft" also reveals details of the front of the cowl and of the propeller hub and the chromed, dome-shaped housing of the propeller's pitch-changing mechanism. Cooling fins of the engine cylinders are in view.



The outboard engine on the right wing is engine 4. The fronts of the two outboard engines are staggered back from the fronts of the two inboard engines. Also, the overall lengths of the outboard nacelles are somewhat shorter than the inboard nacelles.

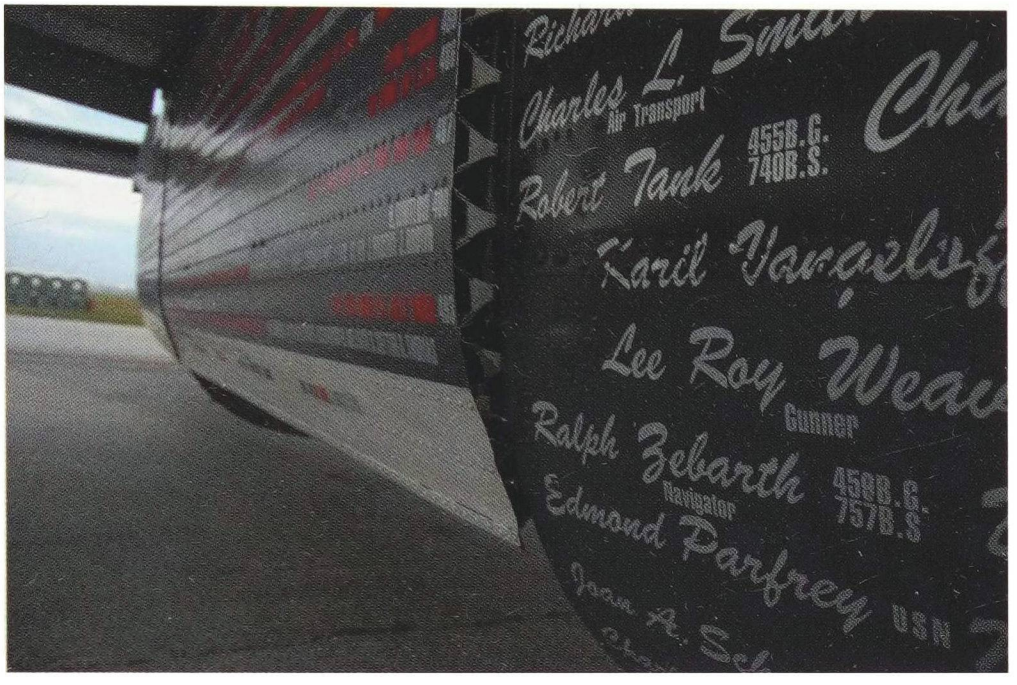
The green navigation light on the bottom of the wing, seen here, and a similar one atop the wing were in later B-24s exchanged for a single navigation light on the edge of the wingtip. A postwar combination navigation light and clear strobe light is on the wingtip.

The top turret of "Witchcraft" is viewed from the right side of the fuselage. To the far right is the rear end of the cockpit canopy, including the copilot's sliding side window with a clear blister. The object below the turret dome is an insulator and lead-in for a wire antenna. *Chris Hughes*

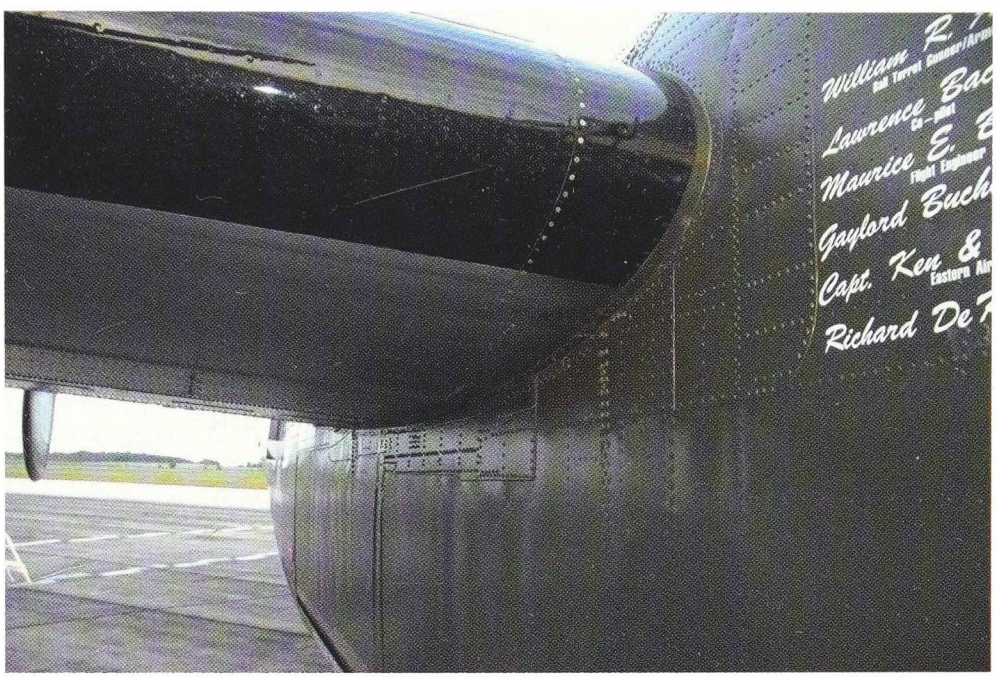


The underside of the right wingtip is viewed from directly below. Wingtips were sometimes damaged in flight or on the ground, but the B-24's wingtips were easily removed and replaced. Also in view are two oblong panels stenciled "INSPECTION."

Twin .50-caliber machine gun barrels seem poised to deal with any threat on the aft-pointing top turret of "Witchcraft." Perforated cooling sleeves were fitted over the actual barrels, the muzzles of which protrude slightly from the fronts of the cooling sleeves. *Chris Hughes*

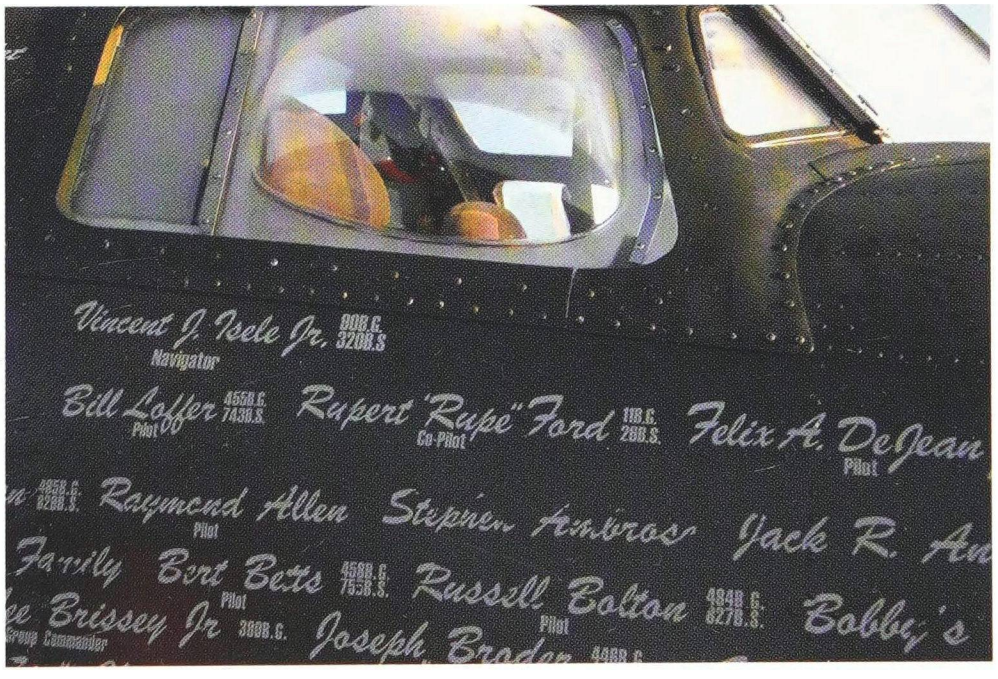


In a view focusing on the front edge of the forward right bomb bay door, the corrugated inner skin is visible. Attached to that inner skin is a smooth outer skin of Alclad, a form of corrosion-resistant aluminum-alloy sheet. Sponsors' names and units are in view.



In a close-up view of the leading edge of the right wing where it joins the fuselage, the bomb bay doors are closed. The leading edges of the wings were fitted with piano hinges at their top rear edges so they could be opened to provide access to plumbing and wiring.

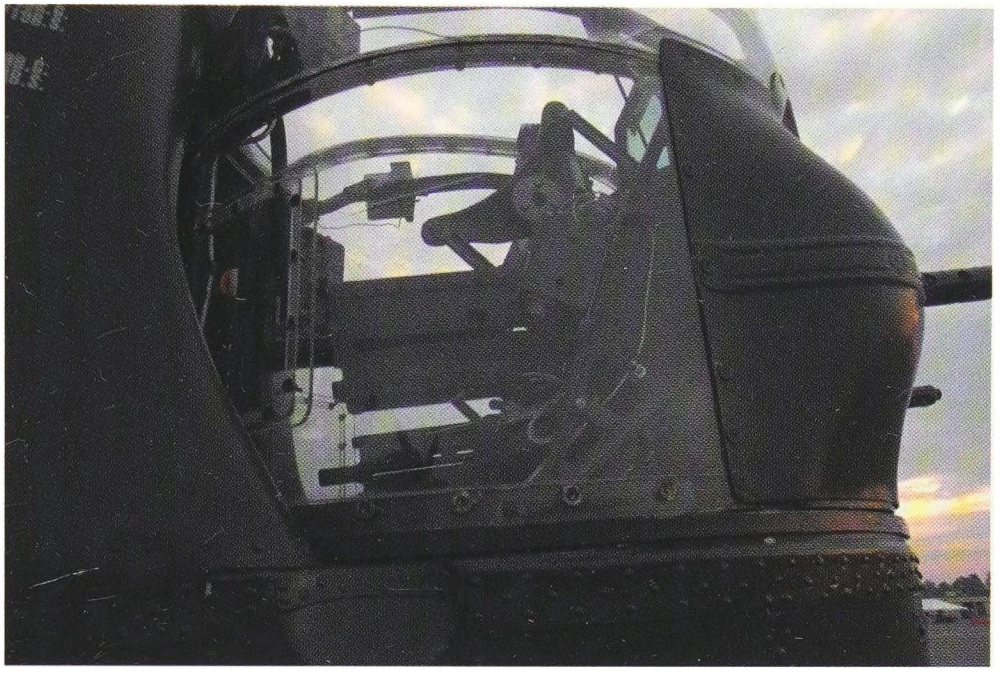
Immediately forward of the front right bomb bay door, toward the bottom of the fuselage, is the trailing antenna, an extendable wire antenna for the liaison radio set. The parts seen here are the tube called the fairlead and the egg-shaped weight at the end of the antenna.



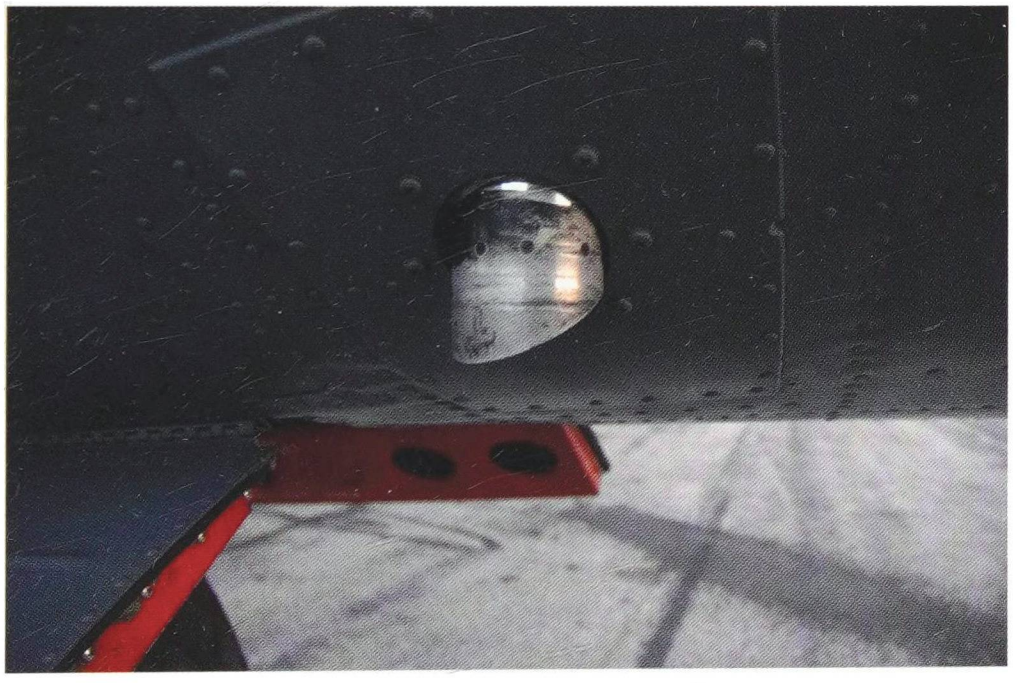
The copilot had a side window with a clear blister similar to the pilot's side window, allowing a wider field of view. The curved piece of metal near the front edge of the window appears to be a stiffener. A triangular direct-vision window is on the windshield.

"Witchcraft," Consolidated Vultee B-24J-85-CF Liberator, serial number 44-44052, presents its right profile. Extending below the waist compartment is the tail bumper. This retractable fixture was not intended to be a skid, but merely a bumper to prevent damage to the tail and the rear of the fuselage that could result from a bumpy or nose-high takeoff or landing. The red panel below the front of the national insignia is the door to a fire-extinguisher compartment. *Department of Defense*

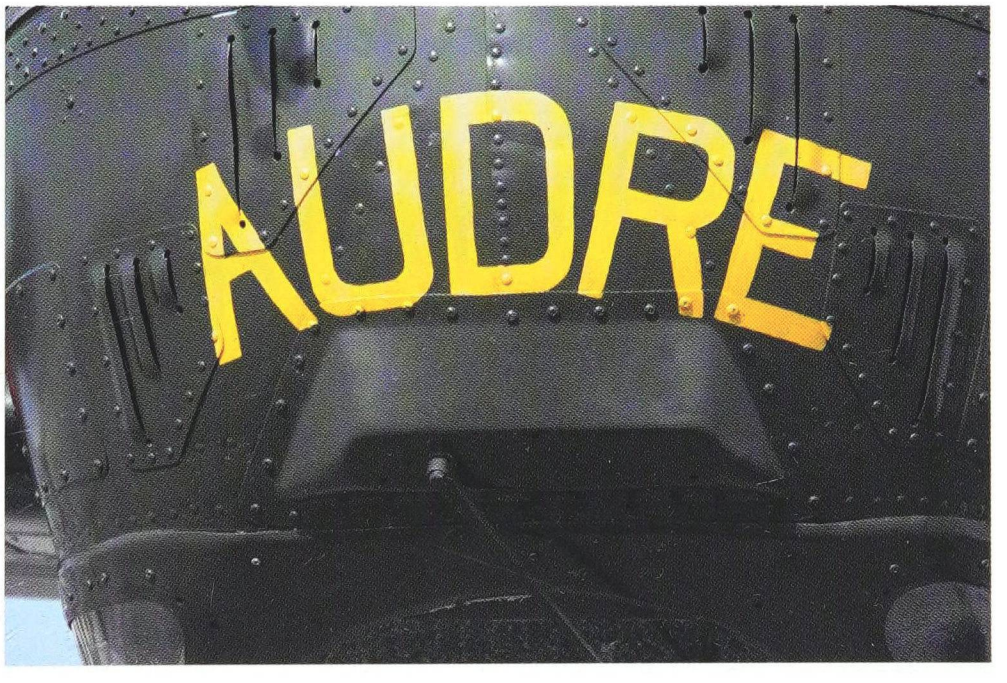
At an air show, "Witchcraft" is observed from its front right quarter. A tube or bar has been wedged under the tail bumper to form an impromptu stand for the tail-heavy bomber. For decades, this Liberator has been delighting attendees at air shows across America.



Coming almost full circle on the walk-around of "Witchcraft," the right side of the Emerson Electric A-15 nose turret is in view. Through the clear dome, the interior frame of the gun mount and the receivers of the two .50-caliber machine guns can be seen.



The sighting tube for a drift meter protrudes through the lower right side of the fuselage immediately to the front of the forward landing-gear bay on "Witchcraft." The piano-type hinge on the outboard edge of the outward-opening landing-bay door is visible.

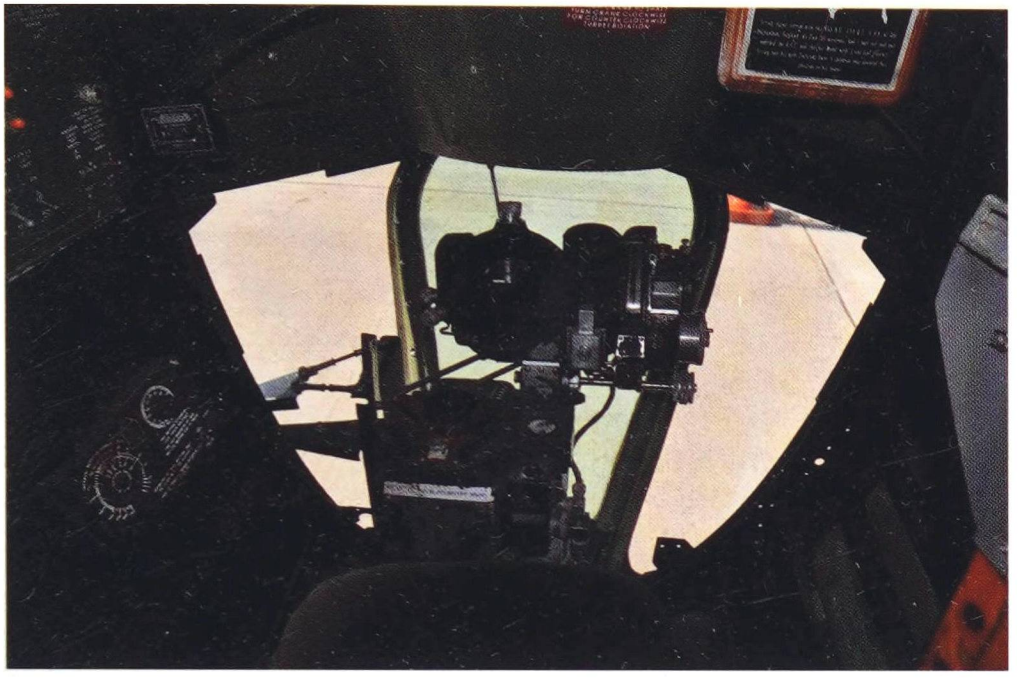


The nose of "Witchcraft" is displayed close-up, showing the several louvered ventilation panels and, at the center, the housing for the wiper mechanism for the bombardier's optically flat window. The housing is fastened with roundheaded Phillips screws.

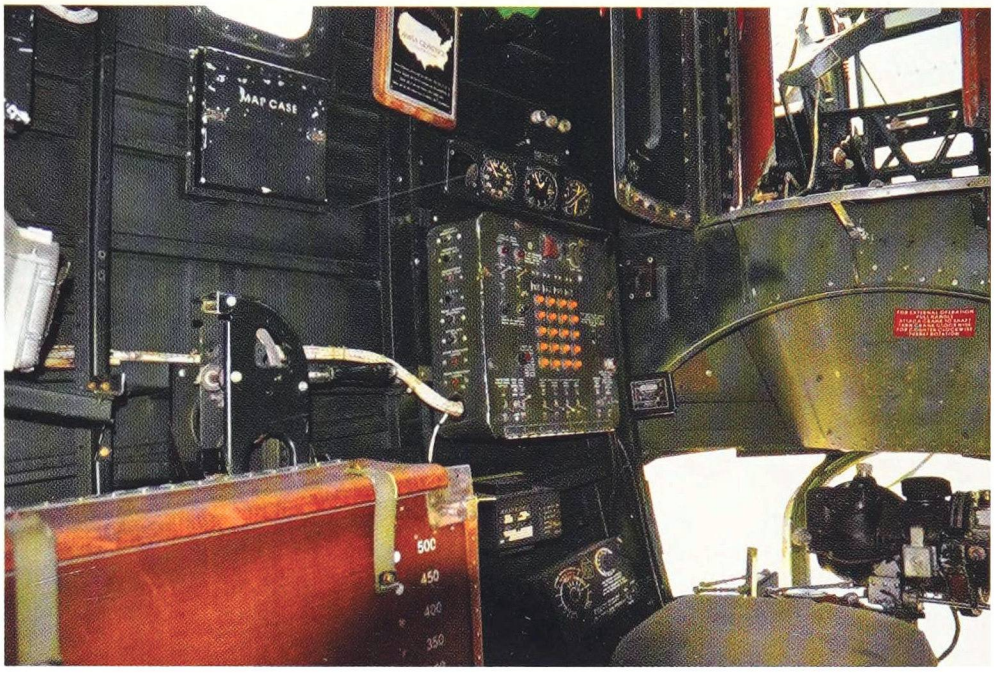
Consolidated Vultee B-24J-85-CF Liberator, serial number 44-44052, currently "Witchcraft," is shown in a previous incarnation, painted to replicate "The Dragon and His Tail," 64th Bomb Squadron, 43rd Bombardment Group, 5th Air Force. For this simulation, the plane had a painted finish intended to replicate a bare-aluminum appearance. Staff Sergeant Sarkis Bartigan painted the artwork on the original "The Dragon and His Tail." *Rich Kolasa*

The original "The Dragon and His Tail" B-24J-190-CO, serial number 44-40973, had elaborate artwork extending the length of the fuselage, featuring a dragon and female pinup. It served with the 64th Bomb Squadron, 43rd Bomb Group, 5th Air Force. The Collings Foundation's B-24J 44-44052, here, was previously painted to replicate the markings of "The Dragon and His Tail." *Rich Kolasa*

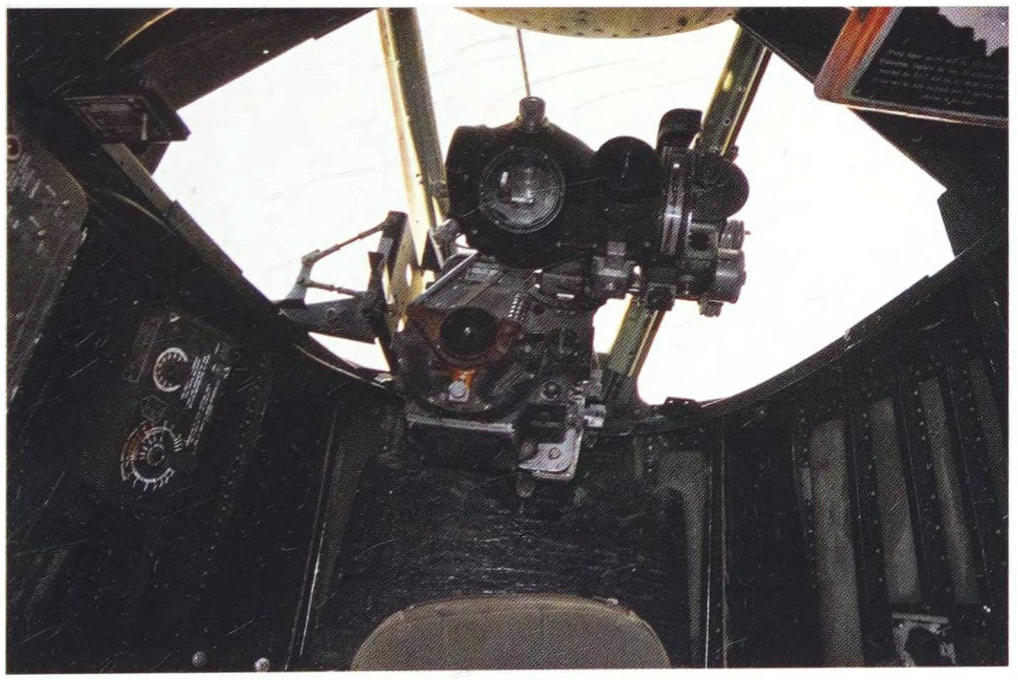
"Witchcraft" is viewed from below during a flight. The ball turret is retracted in the well in the fuselage aft of the rear bomb bay doors. Those doors are in the closed position. The tail bumper is still lowered, aft of the ball turret. With the landing gear retracted, only the main landing-gear wheels and tires are exposed; all other landing-gear elements of the nose and main gears are hidden from view in their respective bays. *Rich Kolasa*



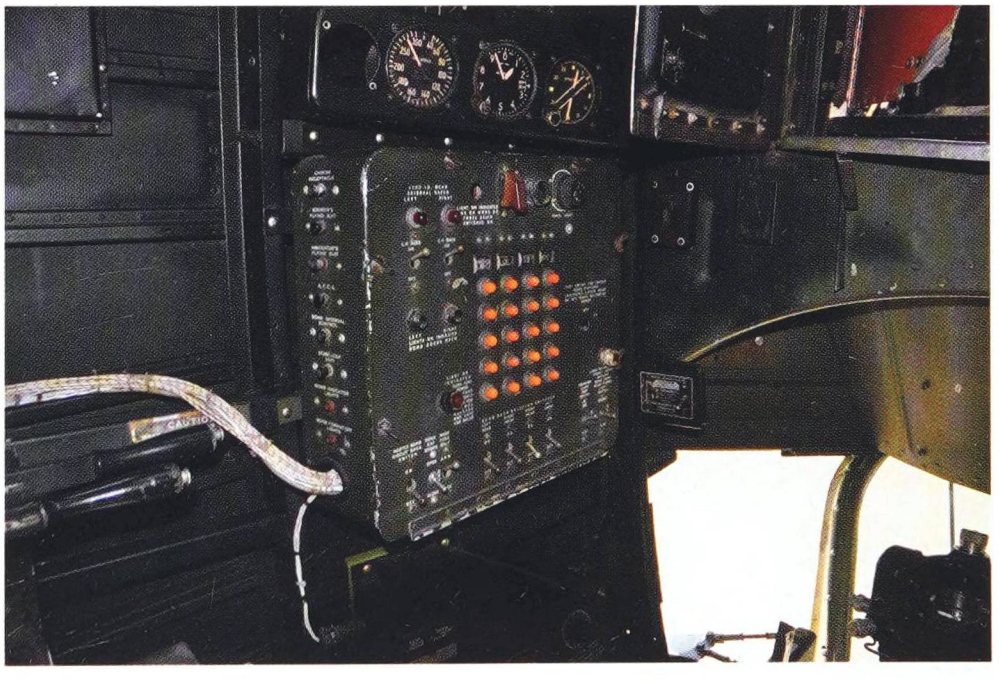
The first of a series of walk-through photos inside "Witchcraft" shows the bombardier's station, including his seat (*bottom*) and the Norden bombsight. At the top center of the photo is the tub of the nose turret. To the upper left is the windshield wiper control. *Chris Hughes*



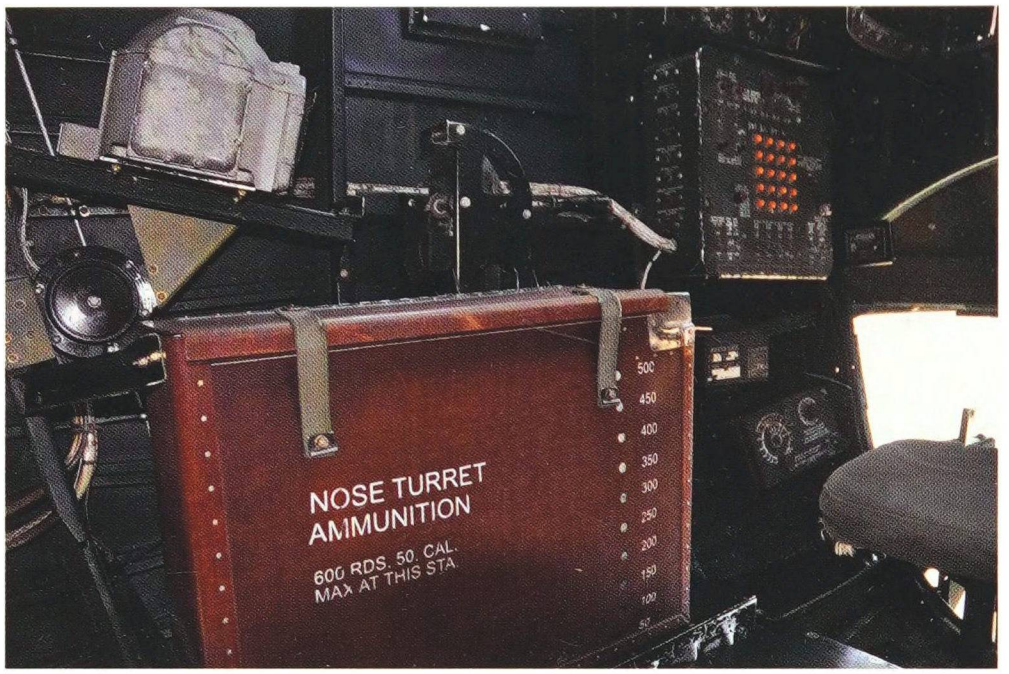
As observed from the rear of the bombardier's compartment, to the lower right is the bombsight and turret tub, to the lower left is the left ammunition box for the nose turret, and to the upper right is the nose turret, with the doors at the rear of the turret dome open. *Chris Hughes*



The Norden bombsight is viewed from a higher angle. This bombsight, top secret during World War II, was a highly advanced instrument for its time, containing a computer and an interface with the autopilot, allowing for highly accurate delivery of bombs. *Chris Hughes*

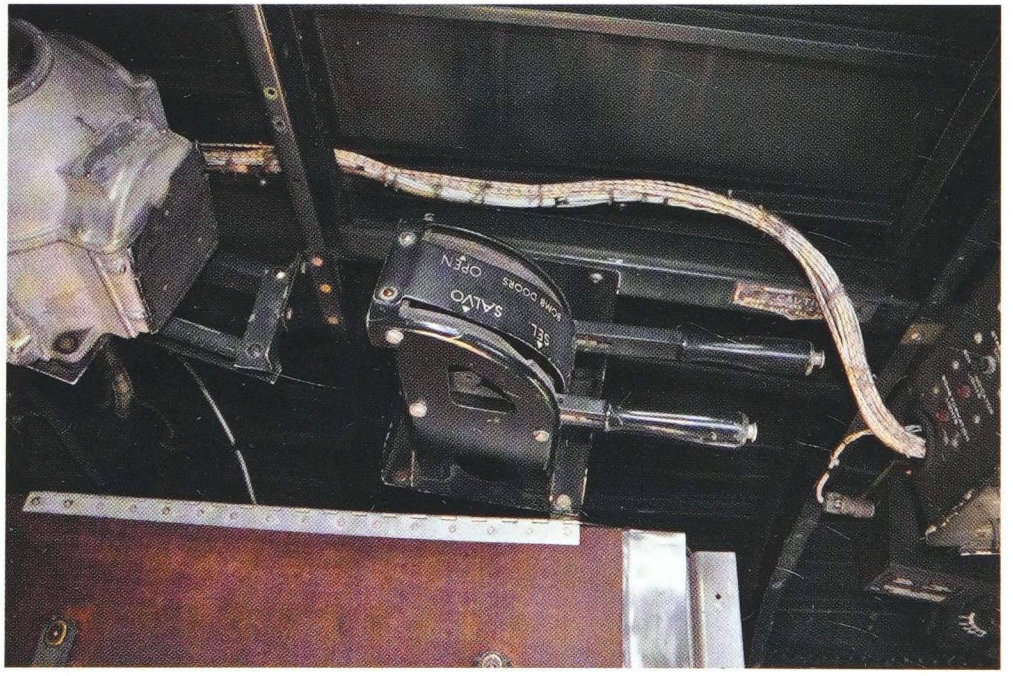


The bombardier's panel is on the left side of the bombardier's station. This panel contained switches and indicators that allowed the bombardier to monitor and control the bombing systems, such as selecting the bombs to be released and their method of release. *Chris Hughes*

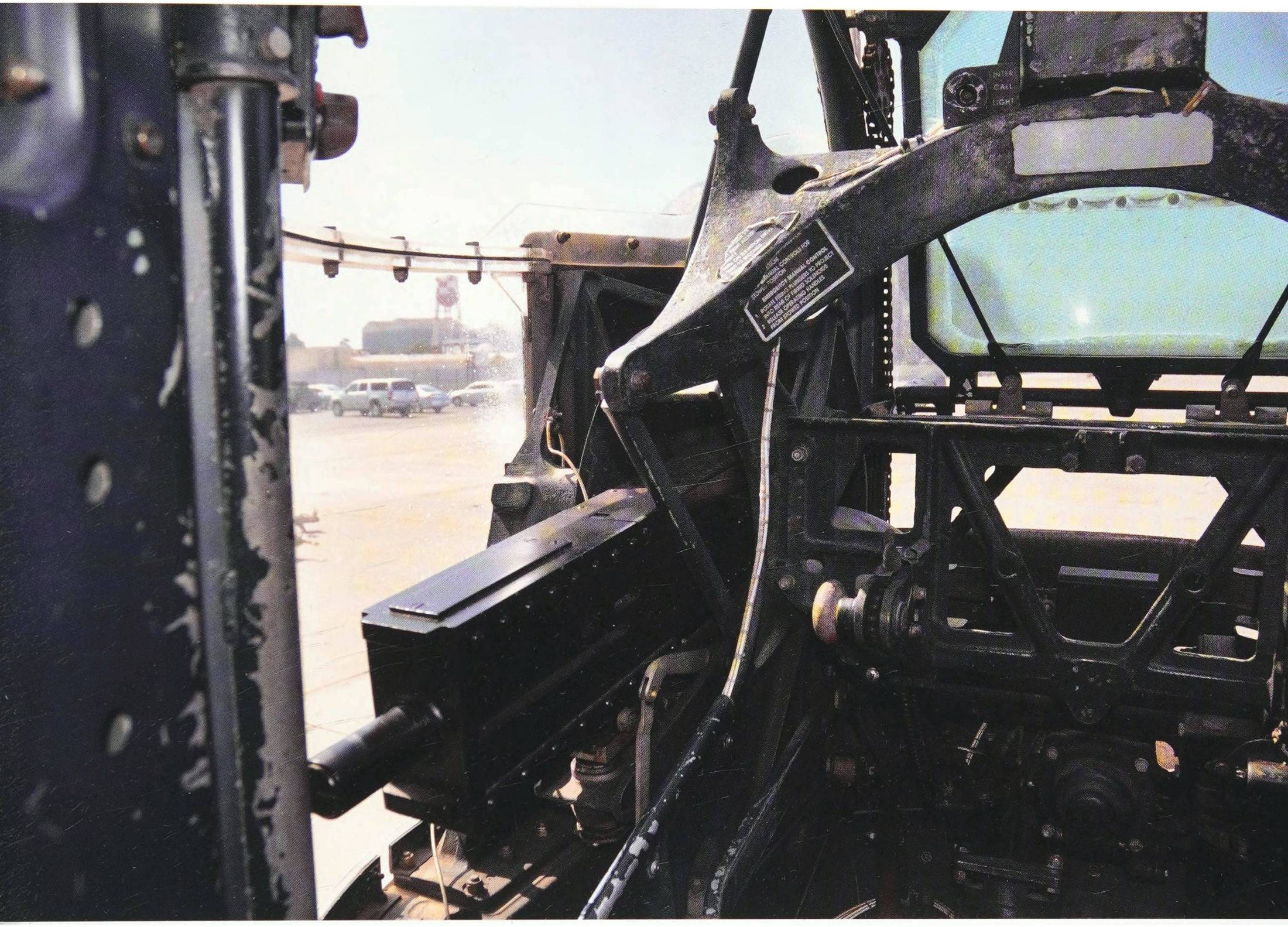


At the center of the photo over the ammunition box is the bombardier's quadrant. The black box with two dials below the bombardier's panel was the intervalometer, by which the bombardier set the timing of the release of the bombs. A static inverter is above it. *Chris Hughes*

The nose turret is viewed through the access door at its rear. The large yoke at the center of the photo held the gunsight and swung the sight up and down in unison with the elevation and depression of the machine guns. To the front of the gunsight yoke is the gunner's bulletproof glass shield. This shield moved at an angle in concert with the movement of the gunsight. *Chris Hughes*



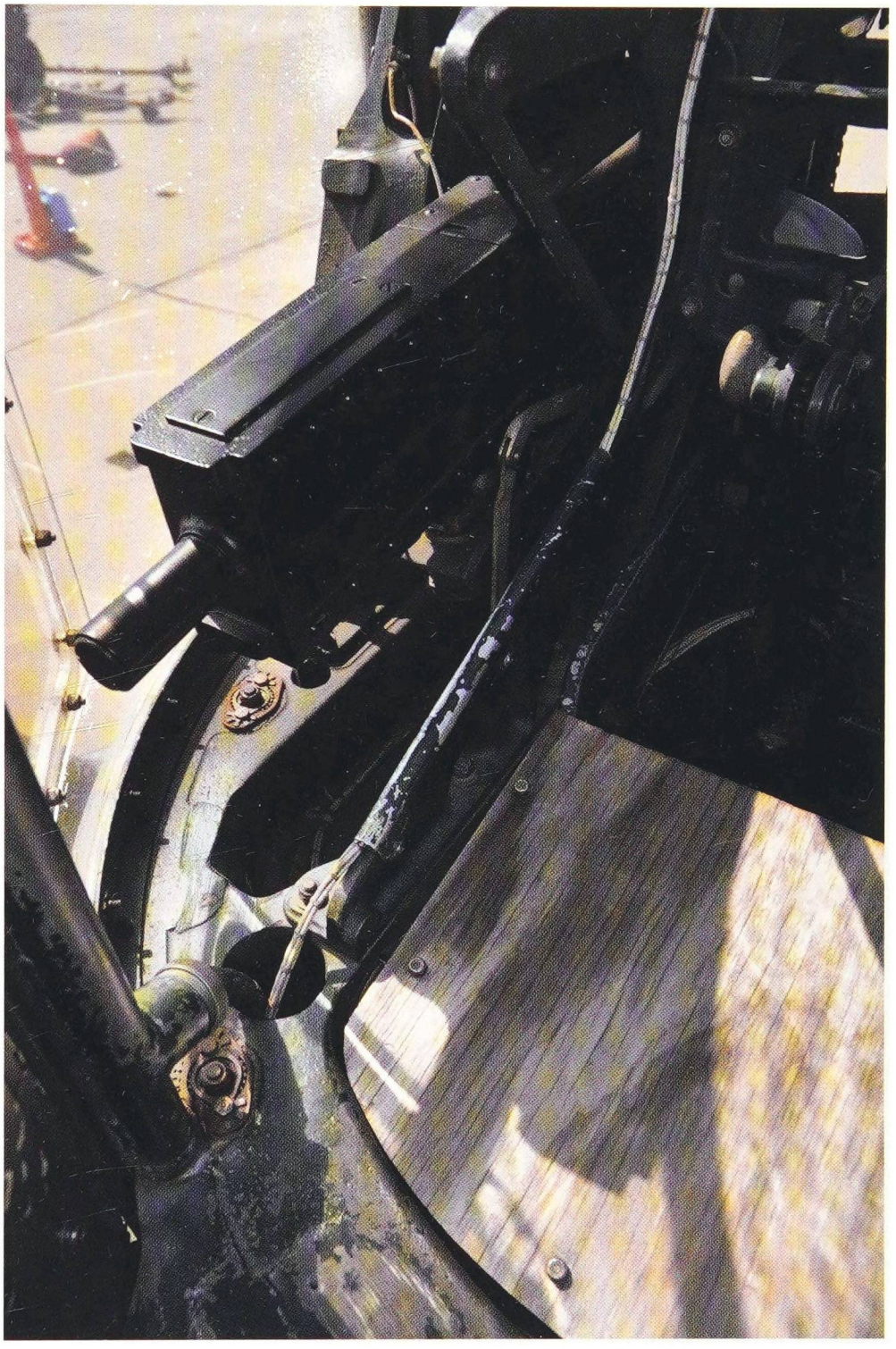
On the bombardier's quadrant, the handle farthest away controlled the bomb bay doors. With the closer handle, the bombardier controlled the bomb releases in the bomb bay and could mechanically release all the bombs at once; this type of release is called a salvo. *Chris Hughes*



To the left side of the Emerson Electric A-15 nose turret is the receiver of the .50-caliber machine gun and its cradle. Above the gun is a joint in the dome of the turret, where flanges of the two Plexiglas sections are held together with fasteners. To the left of the bulletproof glass panel is a bicycle chain routed over a sprocket, for moving that panel in unison with the gunsight. *Chris Hughes*

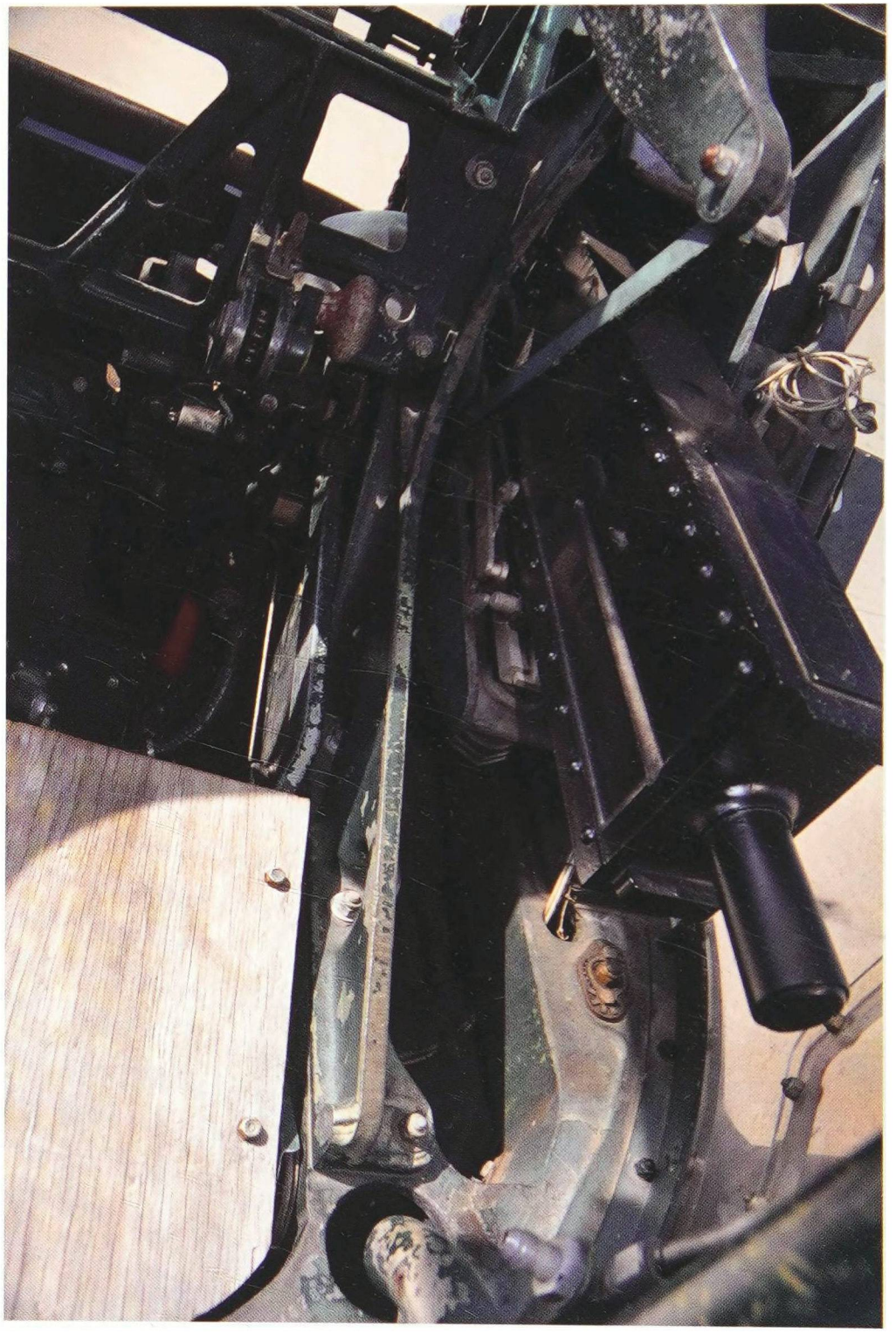
The right side of the Emerson Electric A-15 nose turret is similar in layout to the left side, with the right Browning M2 .50-caliber machine gun's receiver and its cradle being in sight. A link is connected from the gun cradle to the gunsight yoke above it. *Chris Hughes*

Part of the upper frame of the Emerson nose turret is depicted above the left .50-caliber machine gun. Because the turret was cramped and full of sharp projections and other hard objects, it was not a suitable place for the gunner/bombardier to sit during takeoff or landing. To enter the turret, he held onto a bar above the door and hoisted himself, feet first, inside the enclosure. *Chris Hughes*

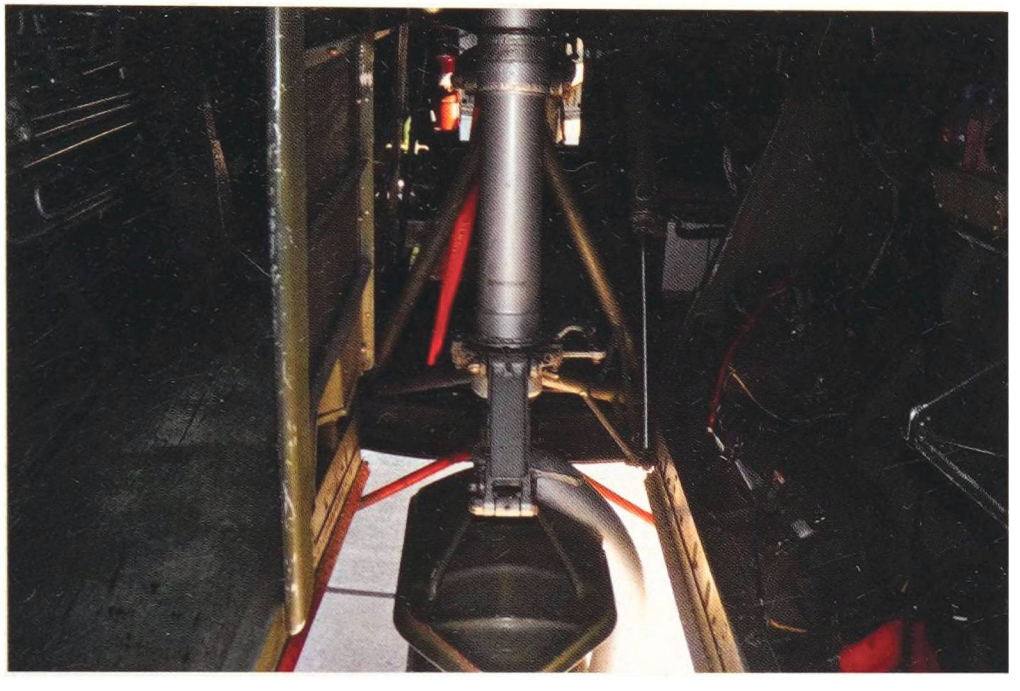


In a view of the left side of the Emerson nose turret, a piece of plywood serves as a replacement seat. Chutes conducted .50-caliber ammunition from the boxes below and to the rear in the bombardier's compartment up through the floor of the turret tub and to the inner sides of the machine gun receivers. Once the guns were manually charged two times, they were ready for action. *Chris Hughes*

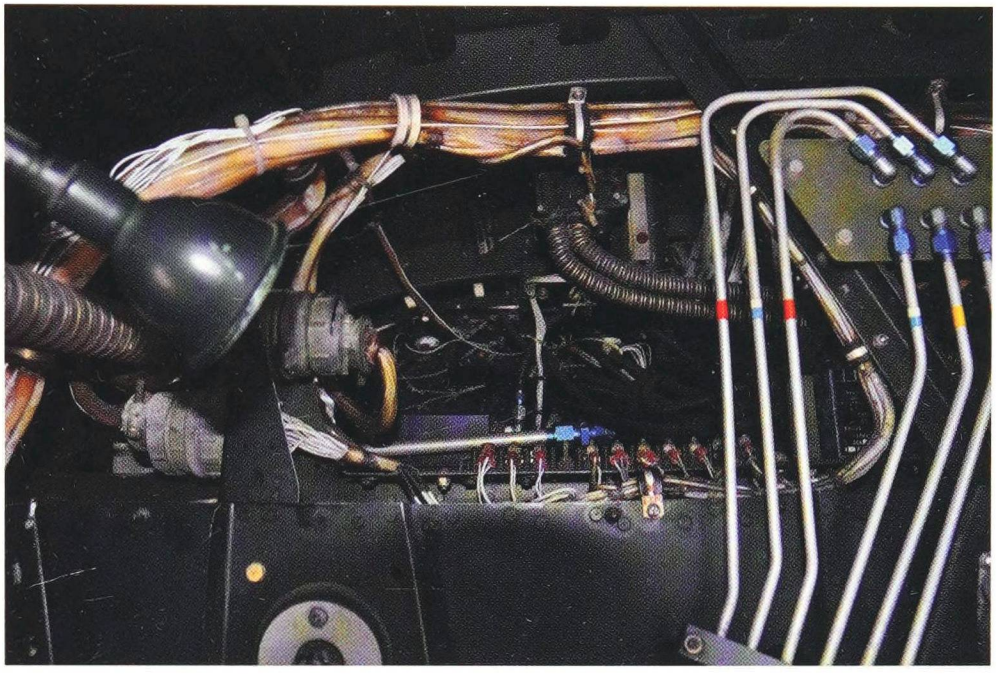
The right gun of the nose turret is observed from the rear. To control the turret, the gunner used manual control handles, turning them to the left or right to traverse the turret and pulling back on them or pushing them forward to elevate or depress the guns. A switch on the right handle allowed the gunner to operate the controls in a high-speed or normal-speed mode as required. *Chris Hughes*



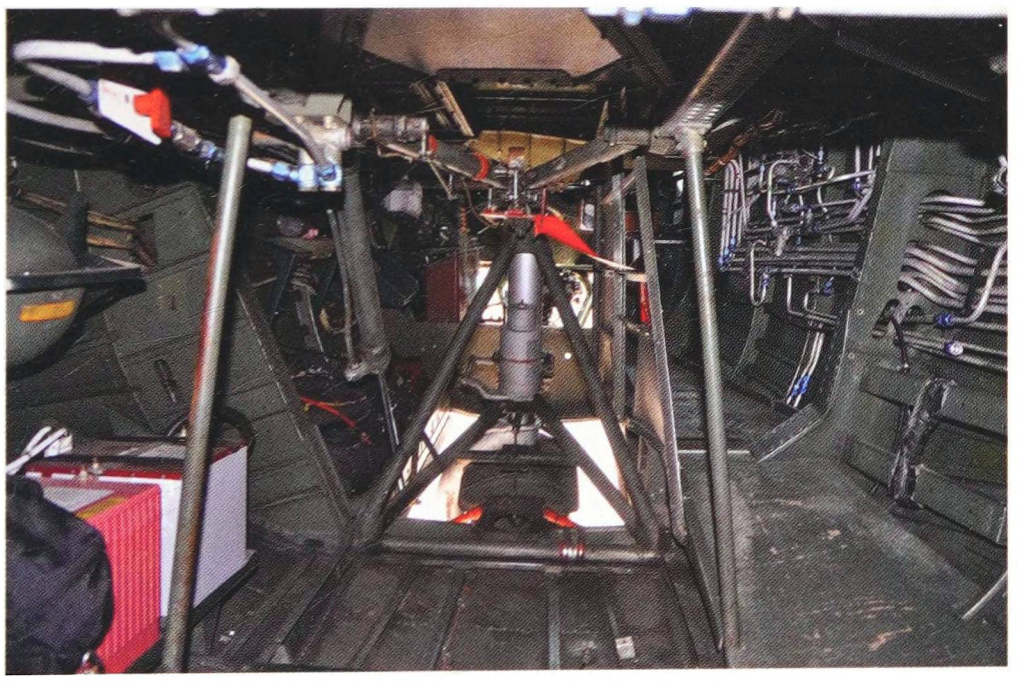
A cutout in the sill of the turret below each of the machine gun receivers provided clearance for the guns as they were elevated above a certain angle. The gunner had two options for firing the machine guns: he could use triggers on each of the control handles, or he could use emergency foot pedals on the buffer tubes of the guns. The gun-charging handles were near the gunner's knees. *Chris Hughes*



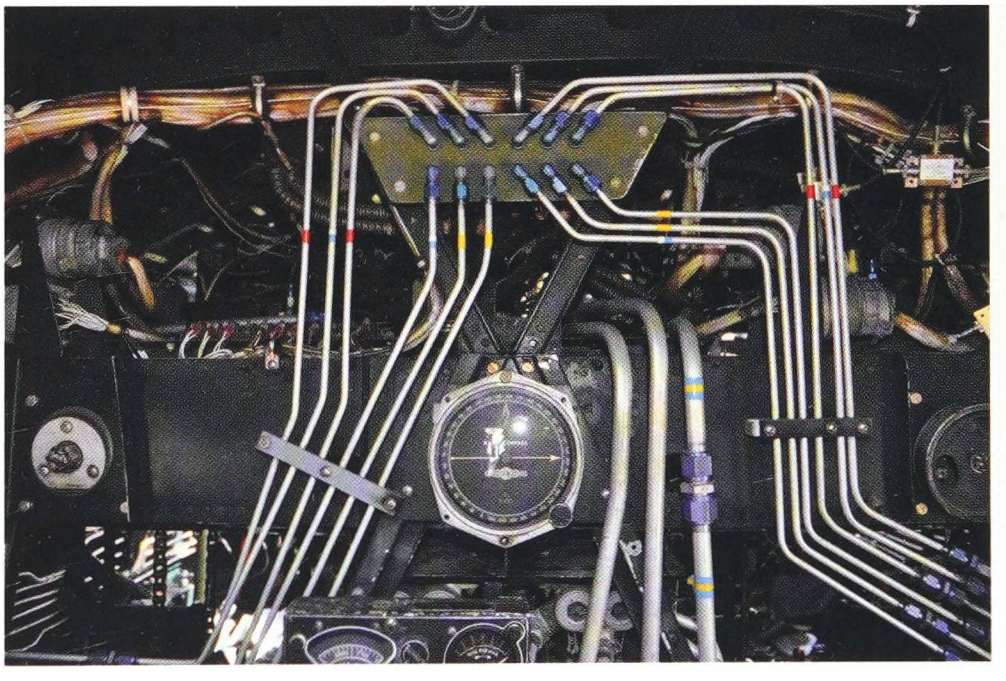
Aft of the bombardier's station is the support apparatus for the nose landing gear. In this view facing aft, at the bottom center is the mudguard, above which are the torsion link and the oleo strut. The hydraulic jack that operates the gear is on the right of the strut. *Chris Hughes*



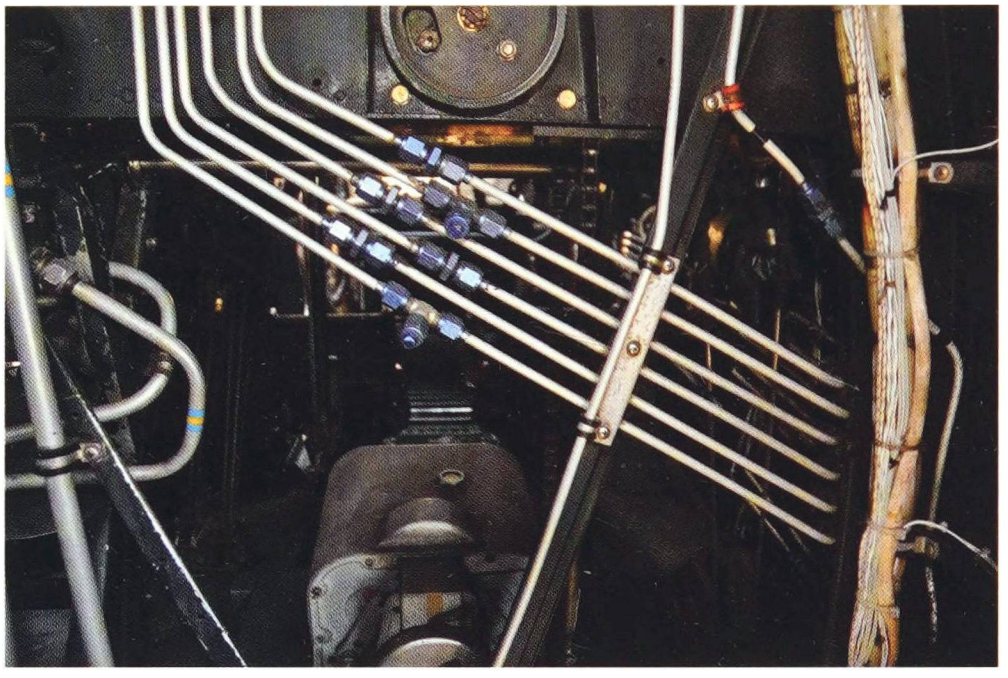
In the aft part of the bombardier's compartment, facing aft from the upper-right part of the compartment, the rear of the copilot's instrument panel is visible through a maze of color-coded hydraulic lines and electrical wires and conduits. *Chris Hughes*



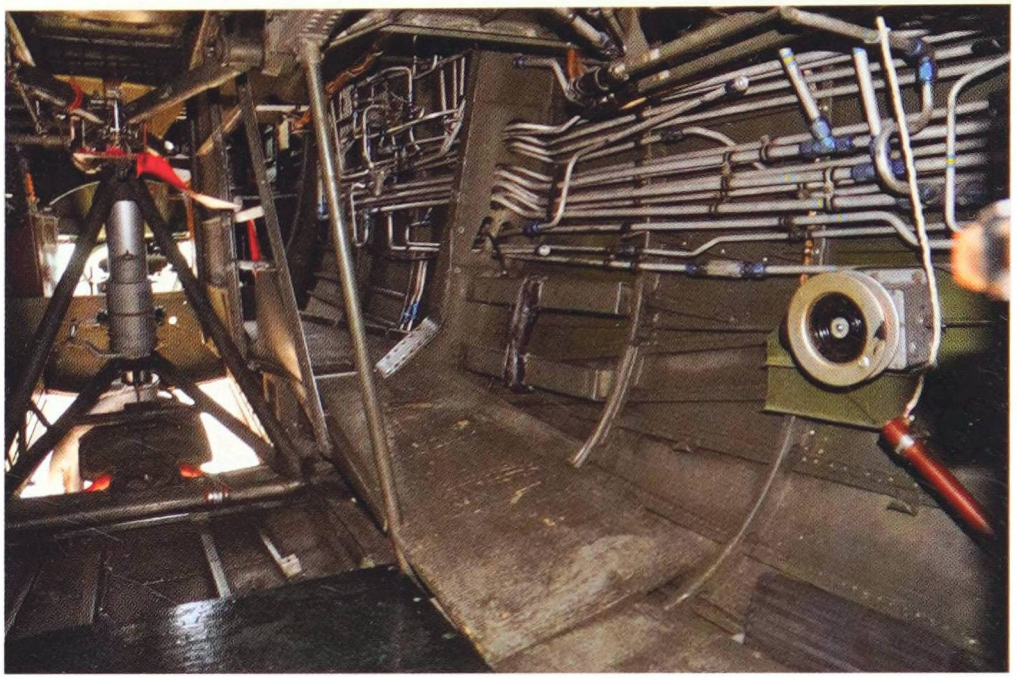
The nose landing gear is observed facing forward. The oleo strut is mounted on two V-struts, at the rear ends of which is a lateral pivot shaft. Retraction or lowering of the nose gear was accomplished by the pivoting of the oleo strut and V-struts swung on the shaft. *Chris Hughes*



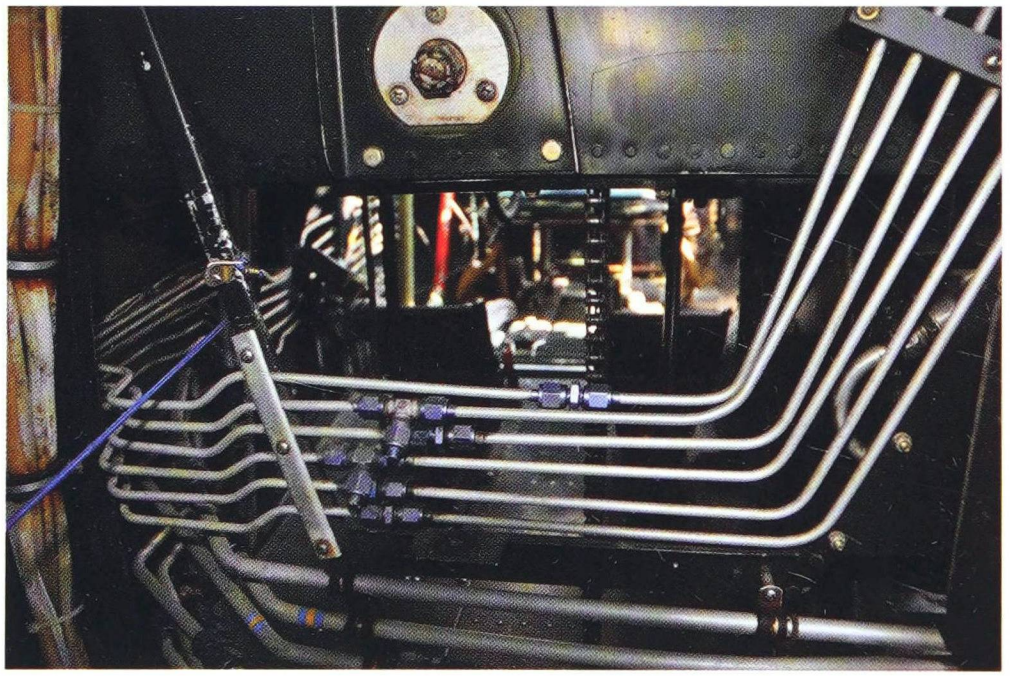
Moving slightly to the right from the preceding photo, at the center is the Bendix-made dial for the SCR-269 radio compass, which used radio signals to establish the aircraft's location. Below the dial is the upper part of the radio-compass control panel. *Chris Hughes*



In a photo taken to the right of and slightly below the preceding one, facing aft, a web of hydraulic lines and electrical wires meet the eye. Hydraulic lines in this area were routed from the cockpit to the landing gear, brakes, flaps, and other systems. *Chris Hughes*



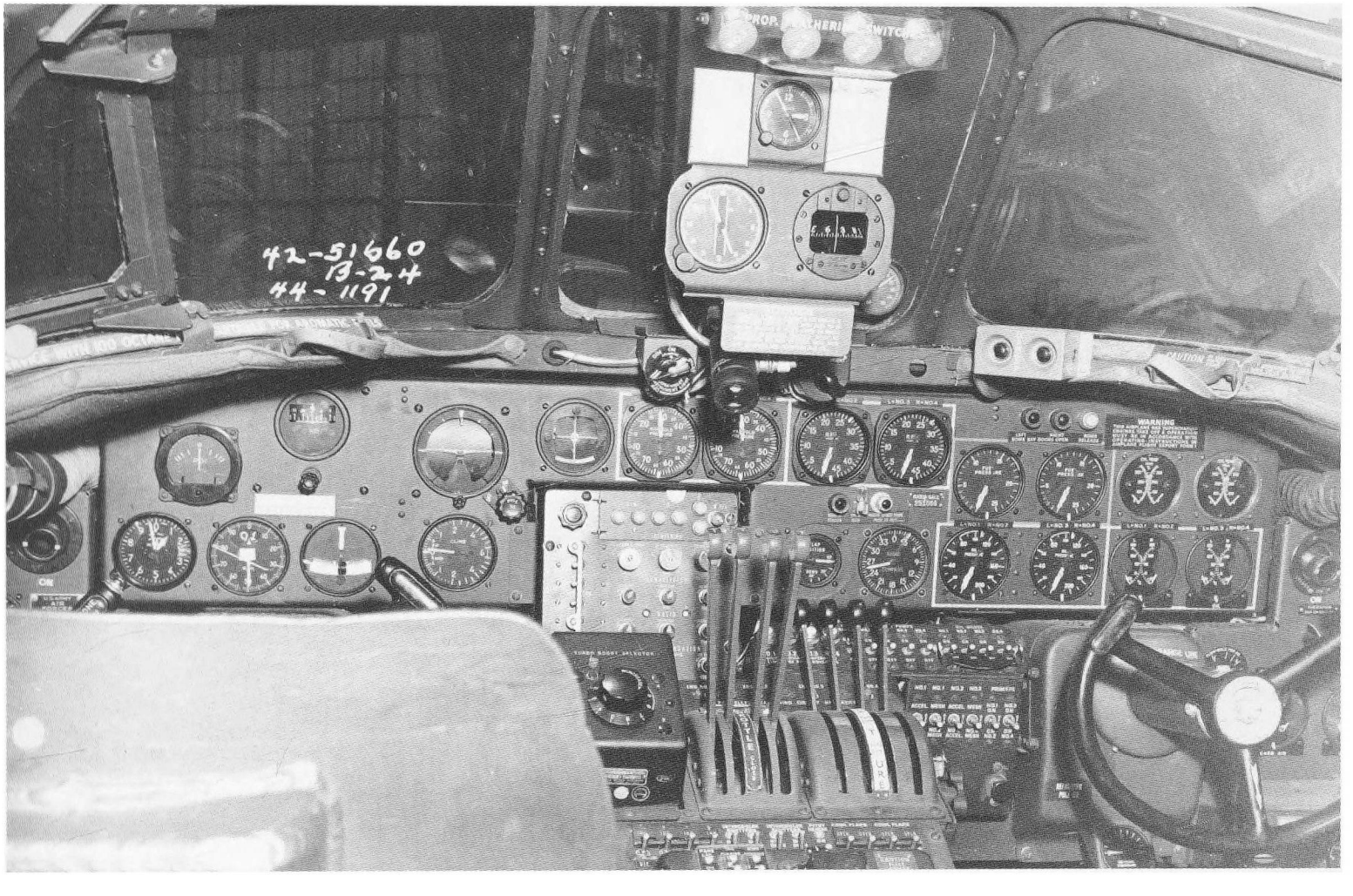
Below the flight deck, facing forward, the nose landing gear is to the left, and a large number of hydraulic lines are routed along the right side of the fuselage. To the far right are the wire-antenna reel and the fairlead for the trailing antenna for the liaison radio set. *Chris Hughes*



A view through the hydraulic lines on the right side of the bombardier's compartment, facing aft, includes a glimpse into the copilot's side of the cockpit in the background. His rudder pedals are visible just beyond the bicycle chain at the center. *Chris Hughes*

On the left side of the fuselage aft of the nose landing gear was a C-10 auxiliary power unit (APU) with a capacity of 2.0 kilowatts. It was powered by a Homelite gasoline engine and was used to start the engines or if the main generator failed in flight. *Chris Hughes*

A partial view of the cockpit of Ford B-24J-10-FO, serial number 42-51660, shows part of the main instrument panel, the smaller panel above the main panel, and the throttle and mixture controls. The box to the left of the throttle controls is the turbo boost selector. *National Museum of the United States Air Force*



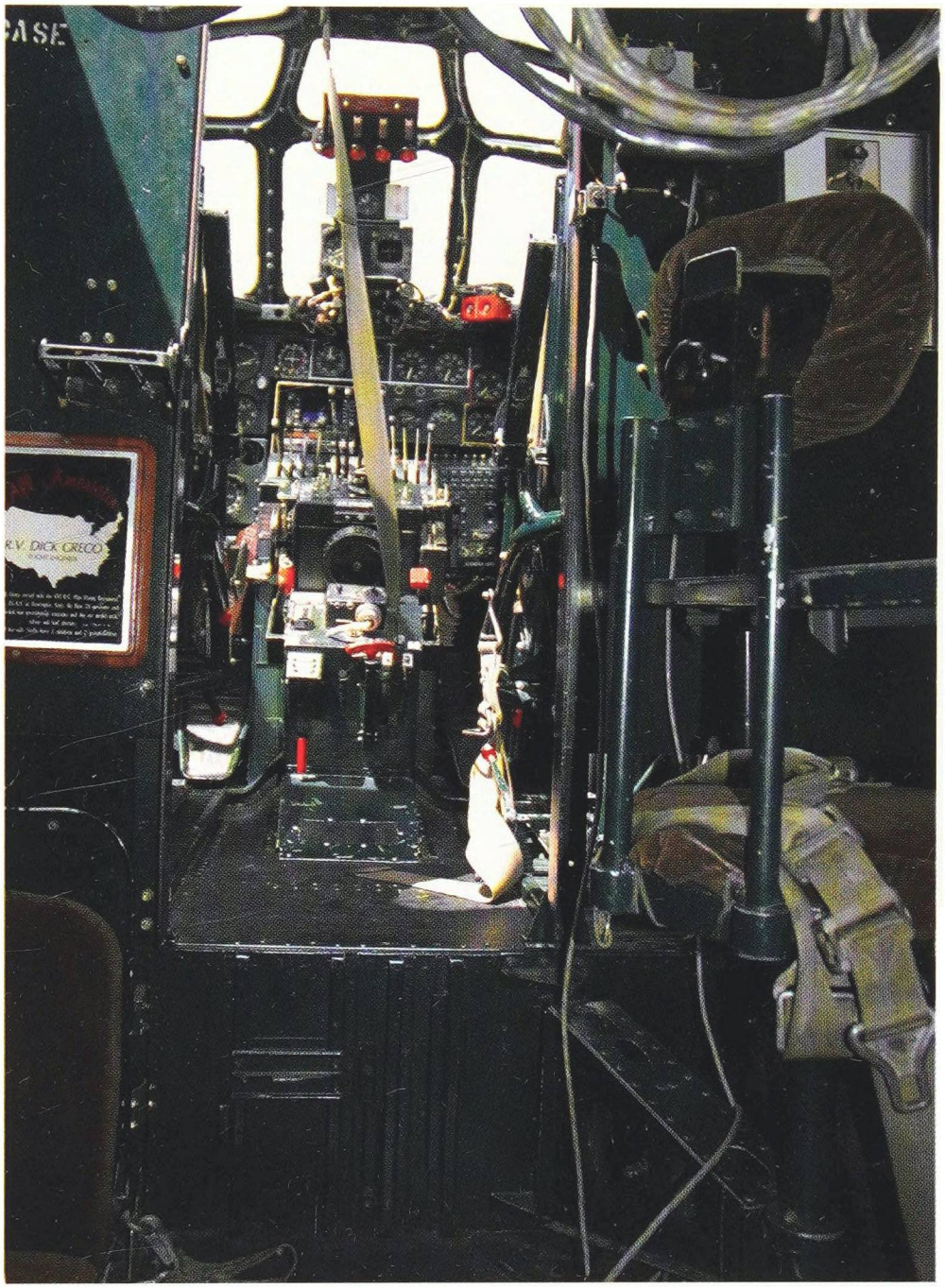
The copilot sits in the right seat during a flight of "Witchcraft." The upper instrument panel obstructed some of the forward view through the center of the windshield. Partially visible beyond the upper instrument panel are the astrodome and blind-landing antenna. *Department of Defense*

The cockpit is viewed from the compartment immediately aft of it, which is the site of the top turret. Originally, this compartment also was the radio operator's station, but the navigator's station was moved here after the nose turret was introduced to the B-24s.

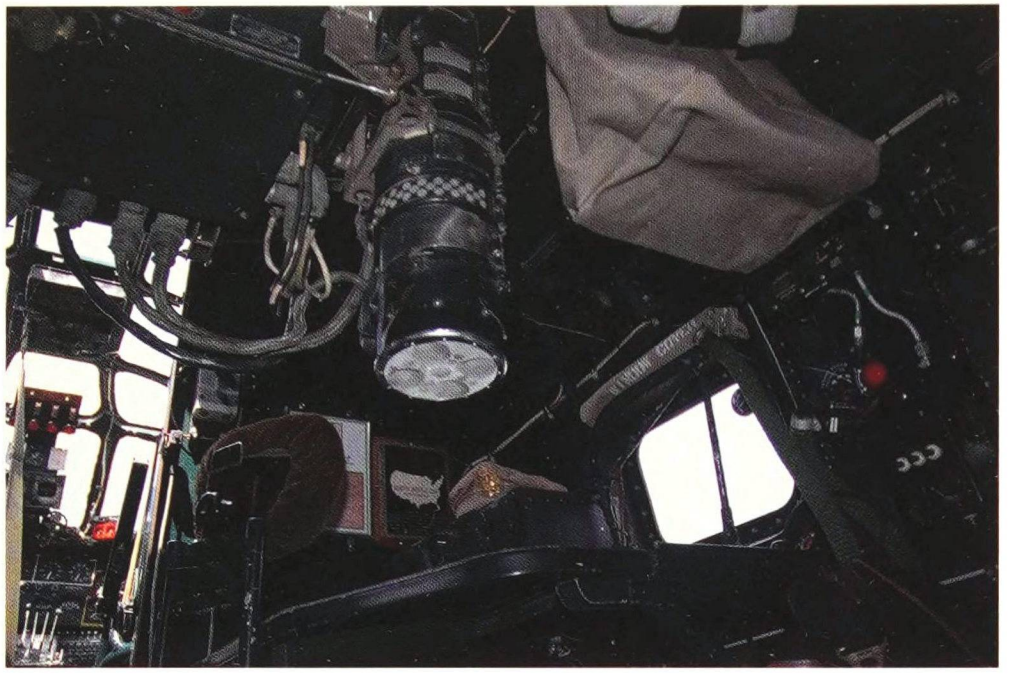
Two seats equipped with seat belts, for strapping into during takeoff and landing, are on the left side of the compartment aft of the cockpit. At the bottom right is an access hatch into the forward part of the bomb bay. A fire extinguisher is at the upper center. *Chris Hughes*

The forward left part of the top turret and navigator's compartment is viewed facing forward, with an insulated liquid container at the center. Forward of the window is a portable oxygen bottle. Above the window is a control and receptacles for a heated suit. *Chris Hughes*

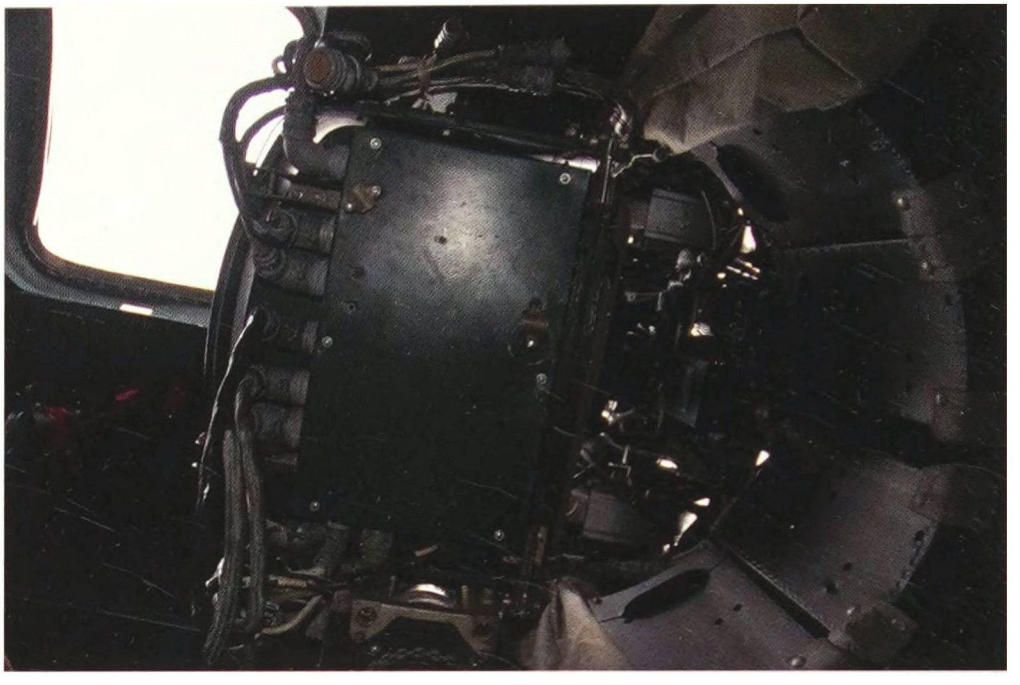
At the top of the compartment, aft of the pilot's position, is the flight-deck hatch, with the opened door hanging down. Protruding from the bulkhead to the rear of the pilot's seat, to the right of center, is a step, to assist crewmen in climbing up to the hatch.



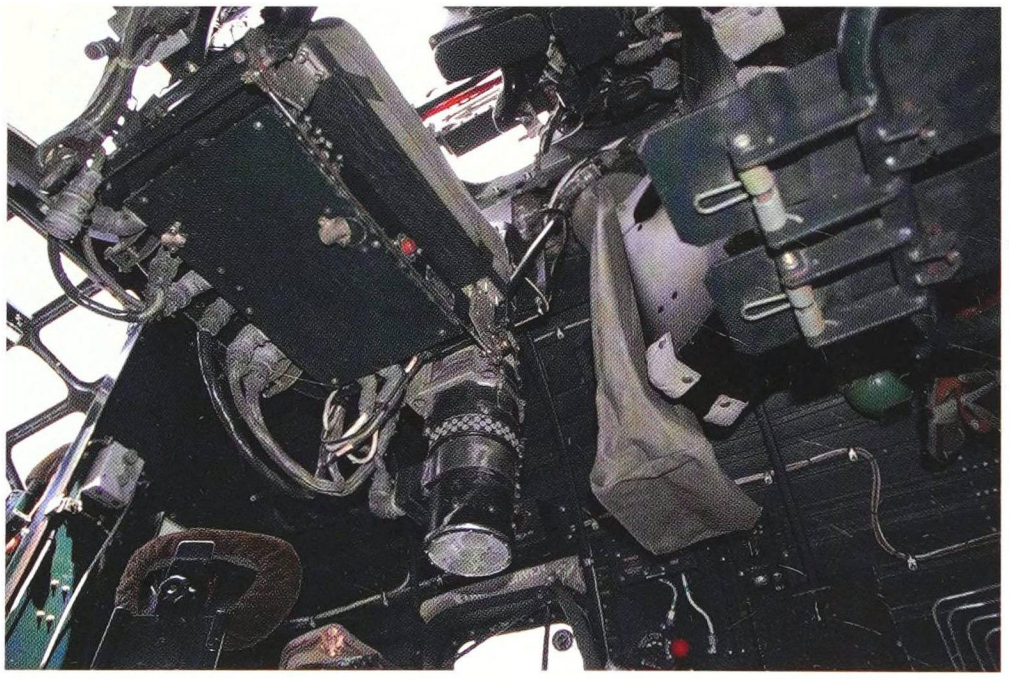
In a view from the first compartment aft of the cockpit, facing forward into the cockpit, to the right is the back of the seat for the navigator. The seat is equipped with a khaki-colored seat belt, and it has an upholstered seat back supported by two stanchions. To the left is a plaque commemorating a B-24 flight engineer, and at the upper right is a commemorative photograph of another B-24 crewman.



The navigator's table and seat back are at the bottom of the photo. The seat faces a small window on the right side of the fuselage. At the top left is the lower part of the seat of the top turret, and the cylindrical object at the top center is part of the turret mechanism.



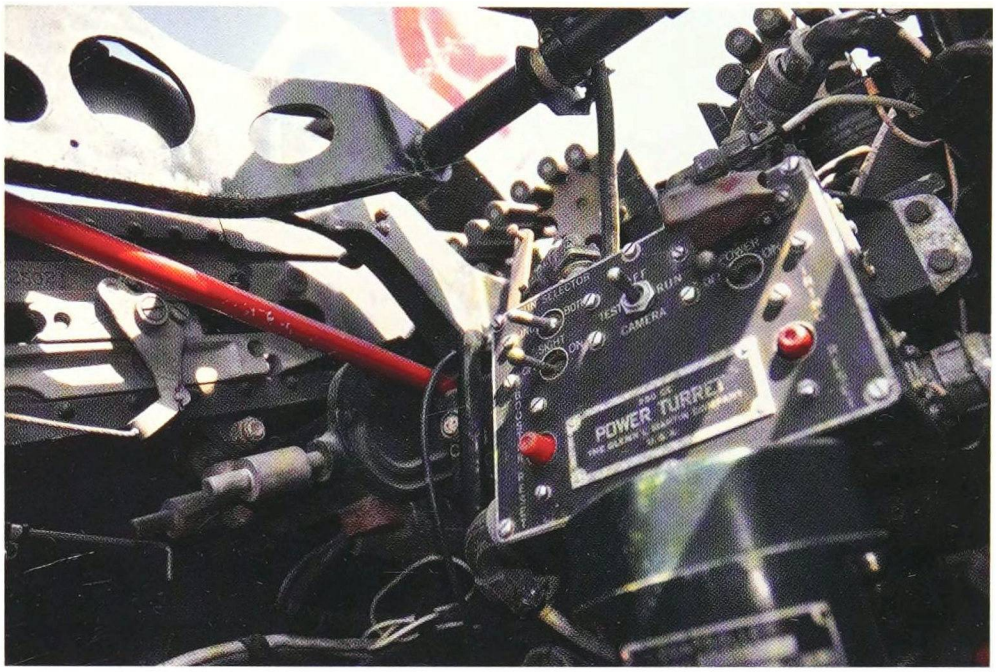
The bottom of the seat of the Martin top turret of "Witchcraft" is viewed facing upward, with the open flight-deck hatch appearing to the top left. To the front of the turret to the right are ammunition boxes for the Browning M2 .50-caliber machine guns.



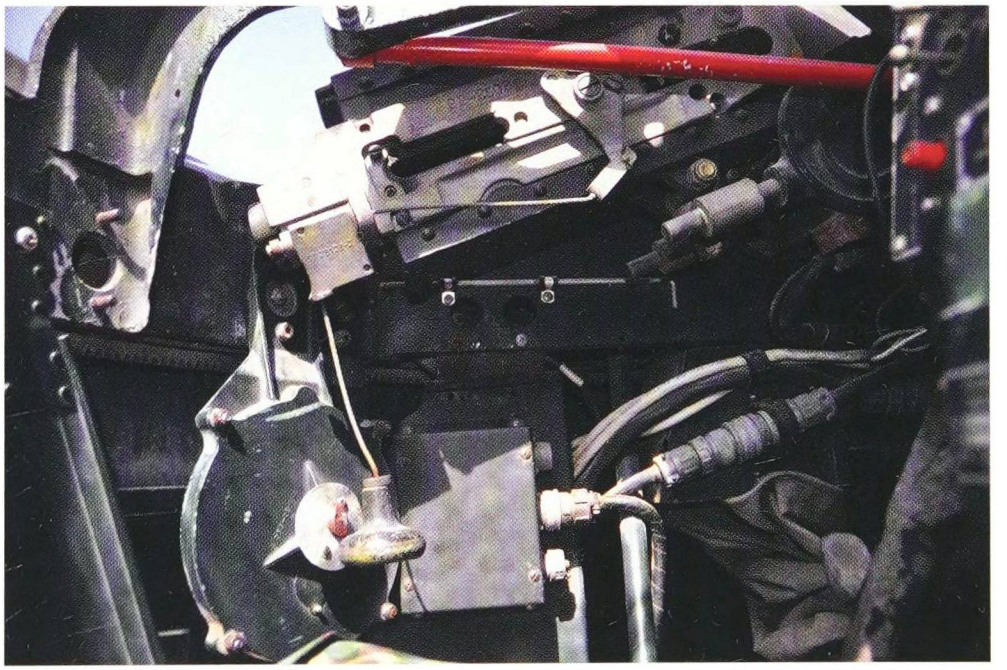
In a fuller view of the lower part of the top-turret seat, electrical cables are routed into metal elbows at the rear of the seat. At the top of the front of the seat is a seat cushion. The dark-green objects with coil springs to the right are the top gunner's footrests.

The four ammunition boxes, or cans, of the top turret are viewed from below, facing to the front on the turret. Each box contained approximately 200 rounds of .50-caliber ammunition. Crash pads are attached with snap fittings to the lower corners of the boxes. *Chris Hughes*

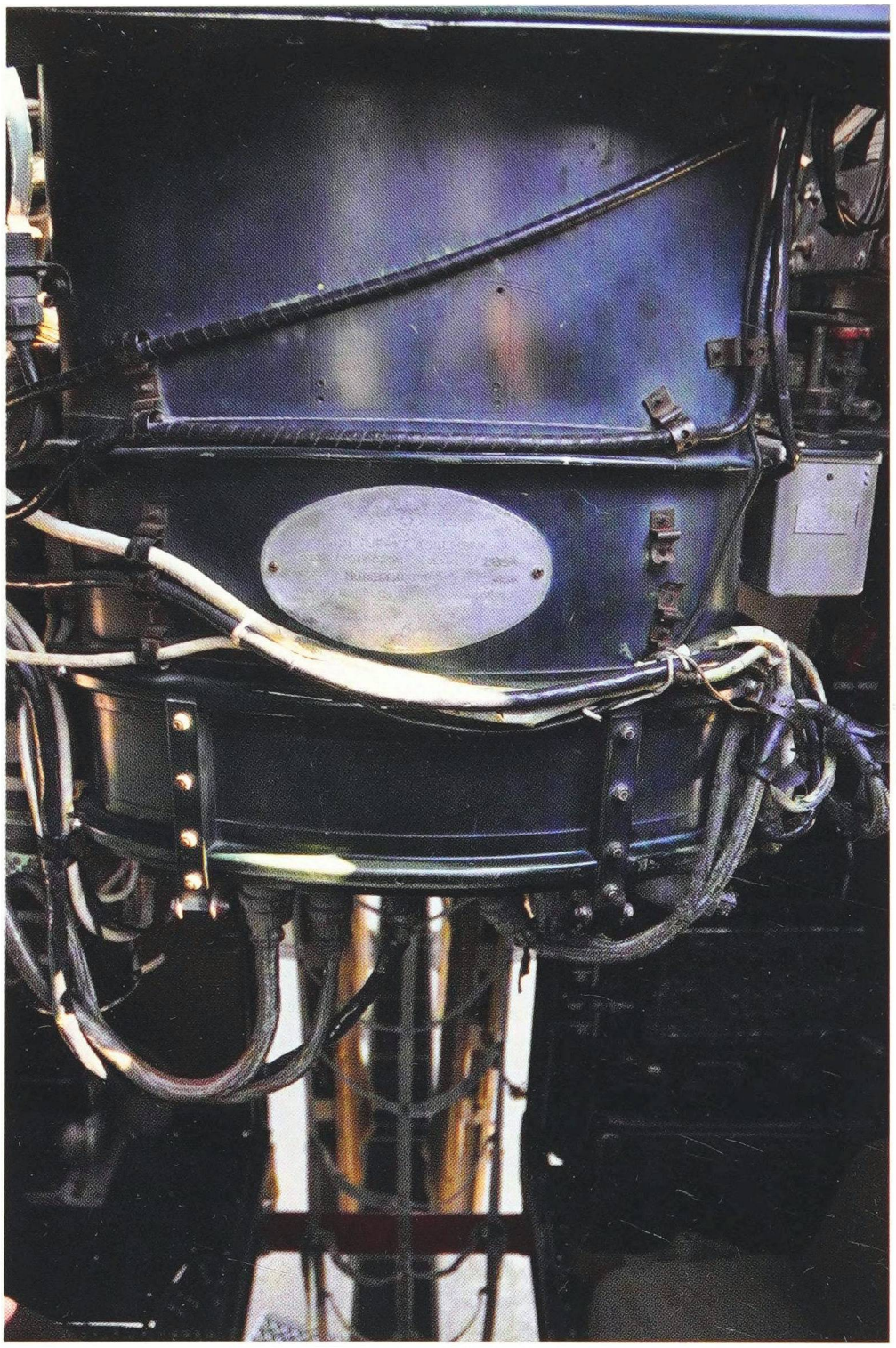
Some of the complex mechanisms in the top turret are viewed by looking upward, with the top of the clear dome of the turret to the upper right. The gunner used a pair of control handles to traverse the turret and elevate, depress, and fire the machine guns. The gunner pulled up on the handles to elevate the guns and pushed down on them to depress them. He pulled on the handles to traverse the turret. To the front of the gunner, in addition to the ammunition boxes, was ½-inch-thick armor. *Chris Hughes*



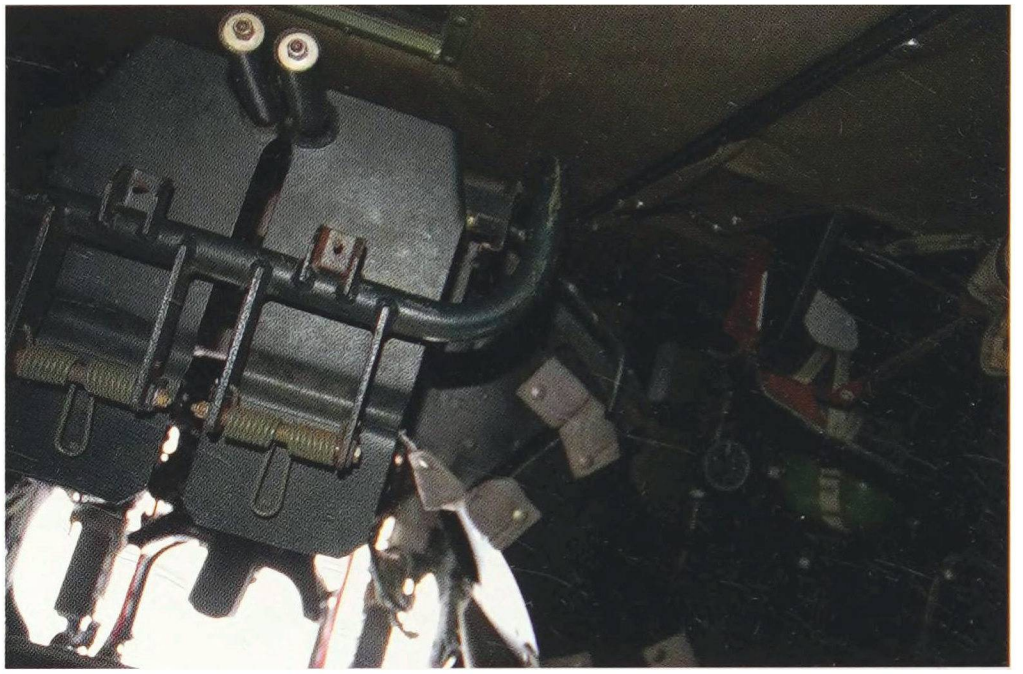
Between the machine guns in the top turret is the gunner's control panel, with switches for the power, the gun camera, the sight, and other systems. Above the panel is the sprocket for the power assist for the left machine gun's linked ammunition. *Chris Hughes*



To the lower left is a knob-shaped charger handle for the left .50-caliber machine gun in the top turret, the receiver of which is at the top of the photo. The gunner charged this gun by grasping the handle with his right hand and pulling is briskly across his chest. *Chris Hughes*

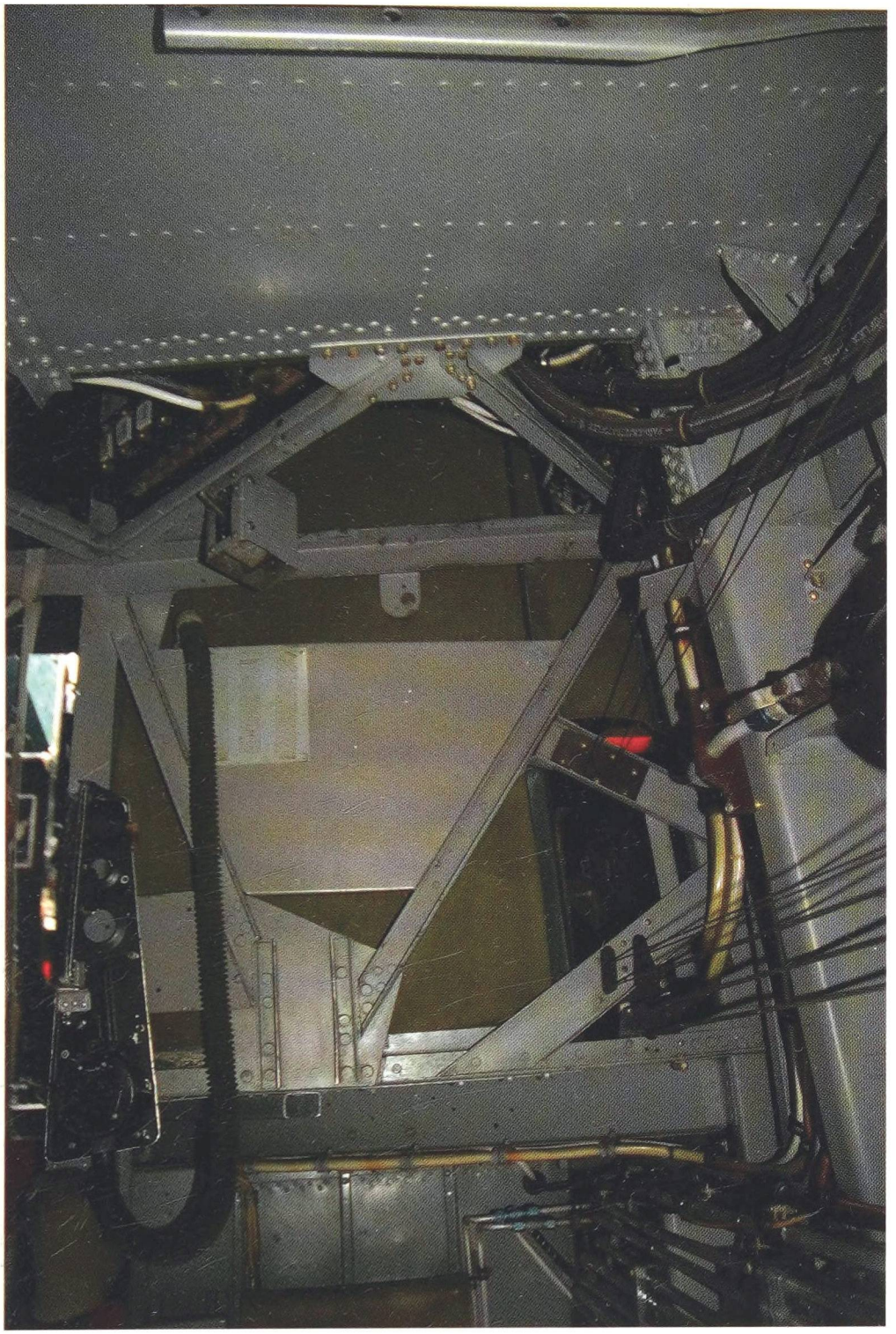


Affixed to the rear of the seat back of the Martin top turret is an oval nomenclature and data plate. Various electrical lines for powering the turret and its subsystems are routed along the seat and fastened in place with clips. Below and aft of the turret seat, toward the bottom center of the photograph, the open forward bomb bay may be seen, including the catwalk running fore and aft along the bottom of the bomb bay. *Chris Hughes*

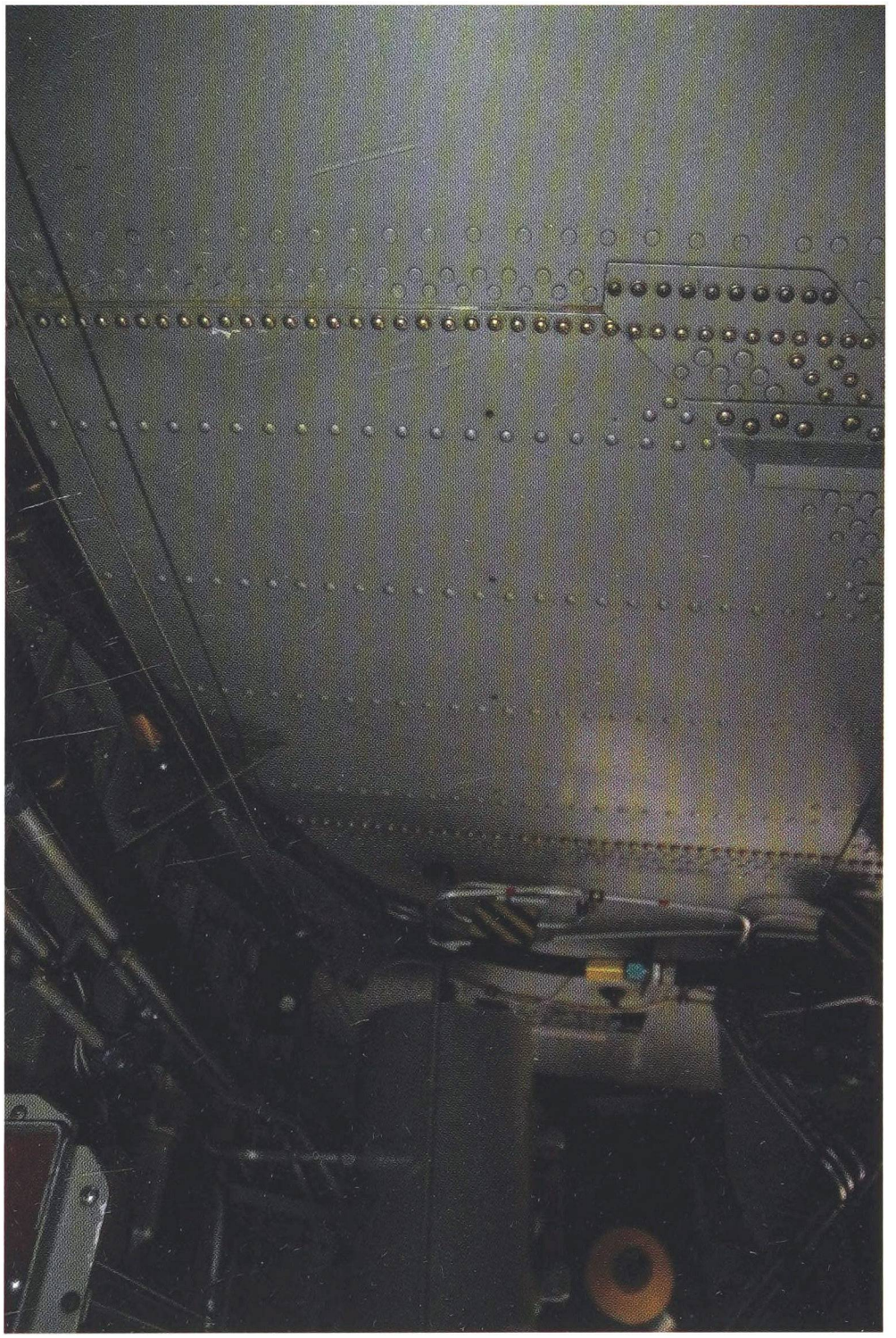


The top gunner's footrests are viewed from below, with the front of the turret being oriented toward the top of the photograph. Not all models of the Martin top turret had footrests. The springs were designed to return the footrests to their normal position.

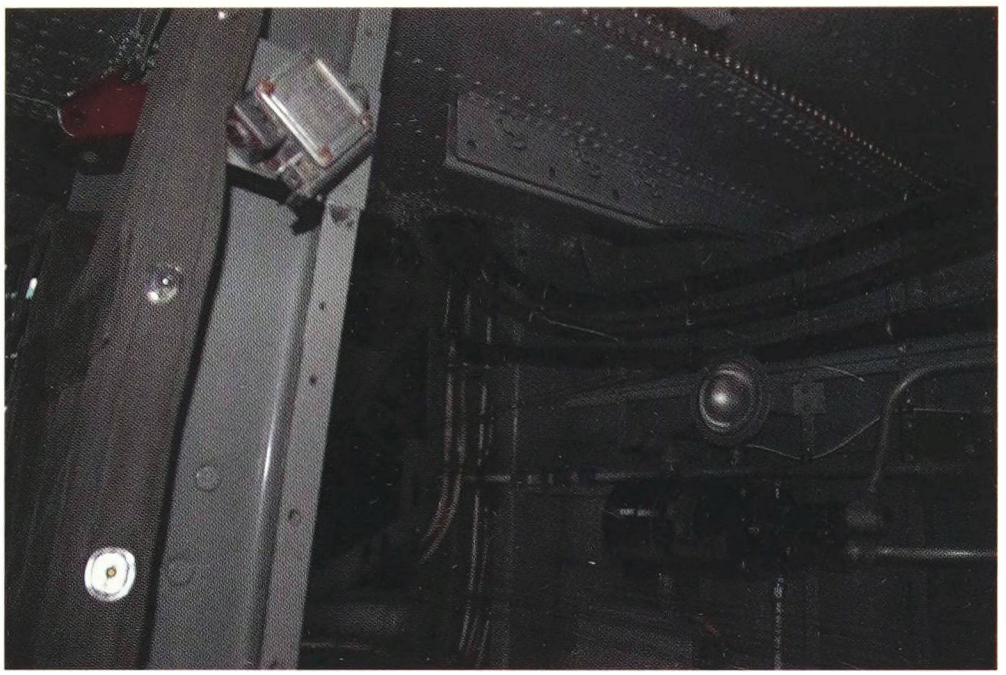
Aft of the turret footrests is the rear bulkhead of the compartment, fitted with insulation to deaden noise and provide thermal insulation. To the left is a green-colored portable oxygen bottle, used at high altitude when a crewman had to leave his station.



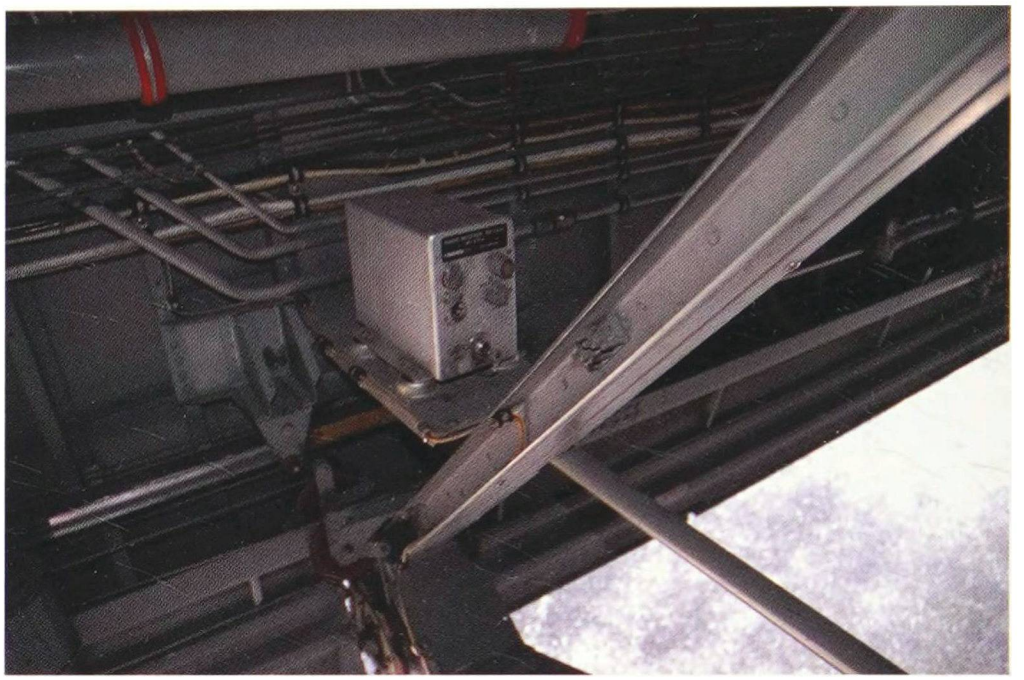
The forward part of the forward bomb bay of "Witchcraft" incorporates a mixture of exposed trusses and frame elements. Also in view from the upper left to the upper right are flexible fuel lines, control cables, and hydraulic lines.



The upper part of the forward bomb bay is displayed, looking aft along the right side. The center wing section passes through the upper part of the bomb bay and is permanently fastened to the fuselage. To the lower right is a bomb with a yellow ring painted on its nose.

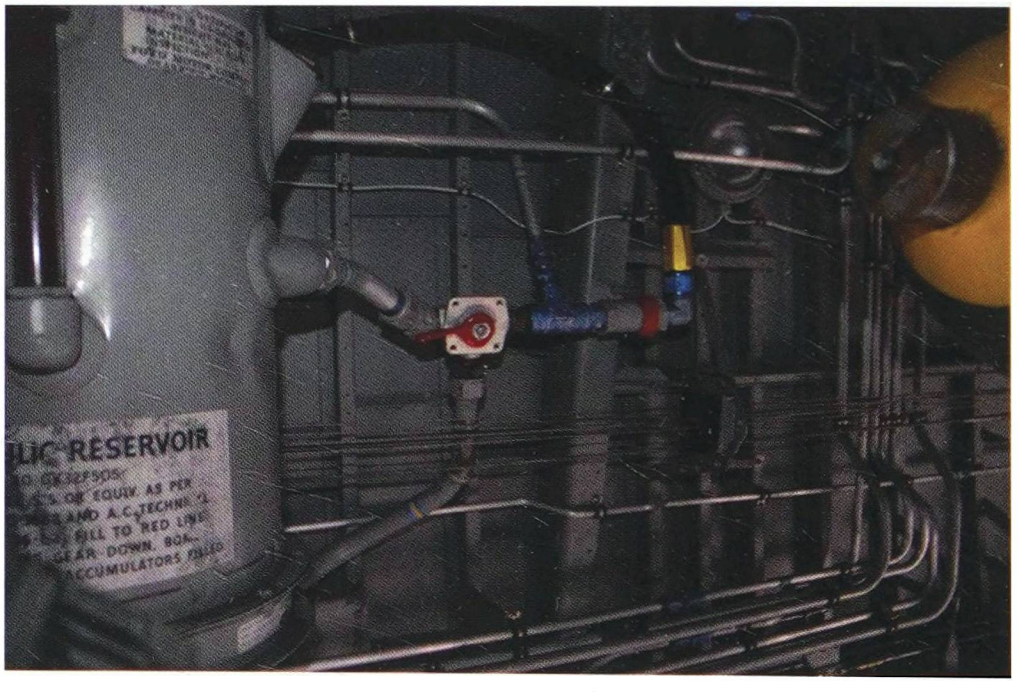


On the outer right wall of the forward bomb bay is an auxiliary hydraulic pump, visible toward the lower right. This electrically powered pump maintained pressure in the main hydraulic system should the main hydraulic pump, driven by engine 3, fail.



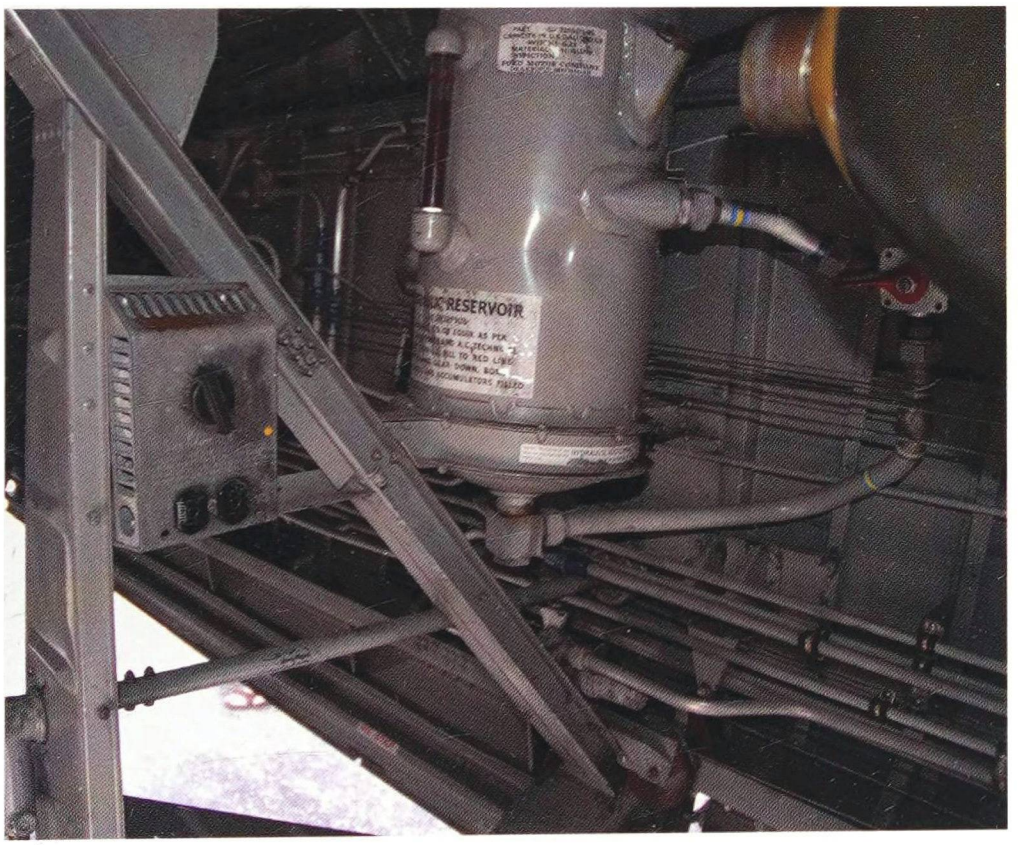
Located on a small rack toward the center of the left bomb bay is a BC-1333 28-VDC radio receiver. This unit was a marker-beacon receiver, part of the blind-landing system, which allowed the pilot to make an instrument landing by using radio beacons at an airfield.

The auxiliary hydraulic pump is toward the upper left in this view, showing control cables and a maze of hydraulic lines immediately aft of the cylinder. The two round objects are bomb bay lights, to provide illumination inside the bay.

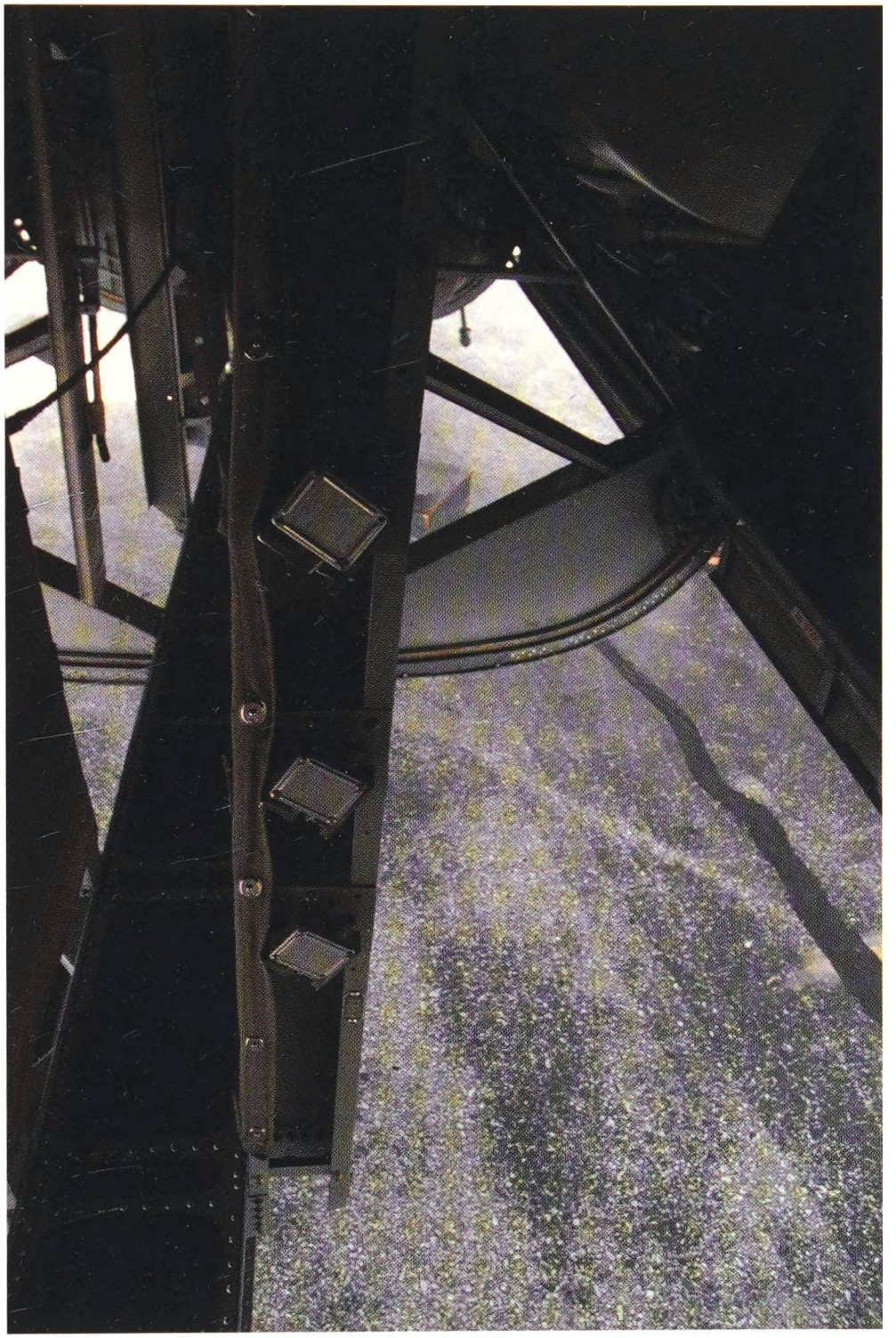


On the right side of the aft bomb bay is a hydraulic fluid reservoir (*far left*). The main hydraulic system used AN-VV-O-366A hydraulic fluid. To the rear (*right in the photo*) of the reservoir, the red handle is for operating the emergency suction valve.

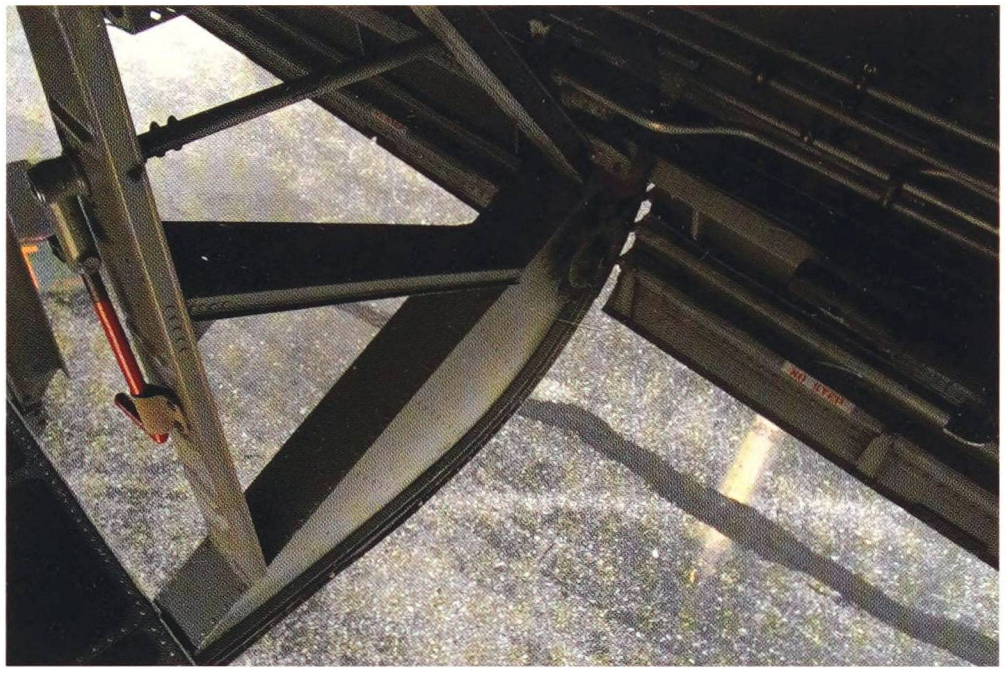
B-24J Specifications	
Armament	Ten .50 cal. machine guns, and 12,800 lbs. of bombs
Engines	Four Pratt & Whitney R-1830-65 supercharged radials of 1,200 hp each (takeoff power)
Maximum speed	290 mph
Cruising speed	215 mph
Range	3,700 miles (max. ferry range); 2,100 miles with 5,000-lb. bombload
Service ceiling	28,000 ft.
Span	110 ft. 0 in.
Length	67 ft. 8 in.
Height	8 ft. 0 in.
Weight	65,000 lbs. (maximum)
Crew	10



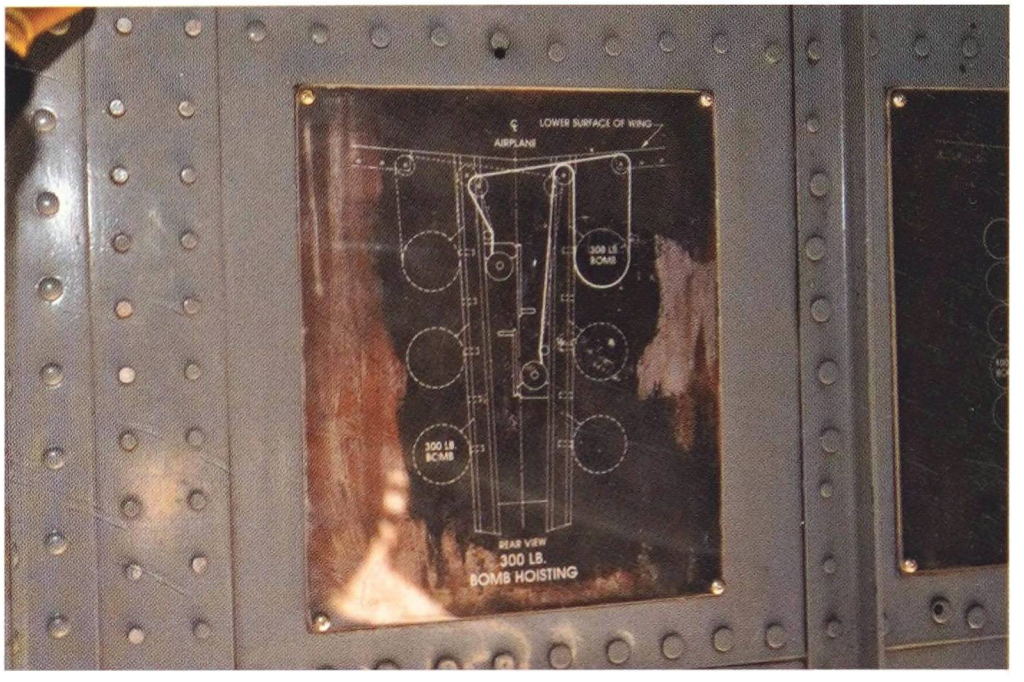
The hydraulic fluid reservoir is viewed from aft and inboard. To the upper right is the front of a bomb. In the foreground to the left is a control and electrical receptacles that allowed a crewman to plug in a heated suit should he need to operate in the bomb bay.



A beam passes longitudinally along the bottom of the bomb bays, forming both a longeron to provide structural strength for this part of the plane as well as a catwalk for crewmen to pass through the bomb bays during flight. To the left are several bomb racks, the bottoms of which are attached to the beam. Running across the center of the photo is a partial bulkhead that separates the forward and aft bomb bays.

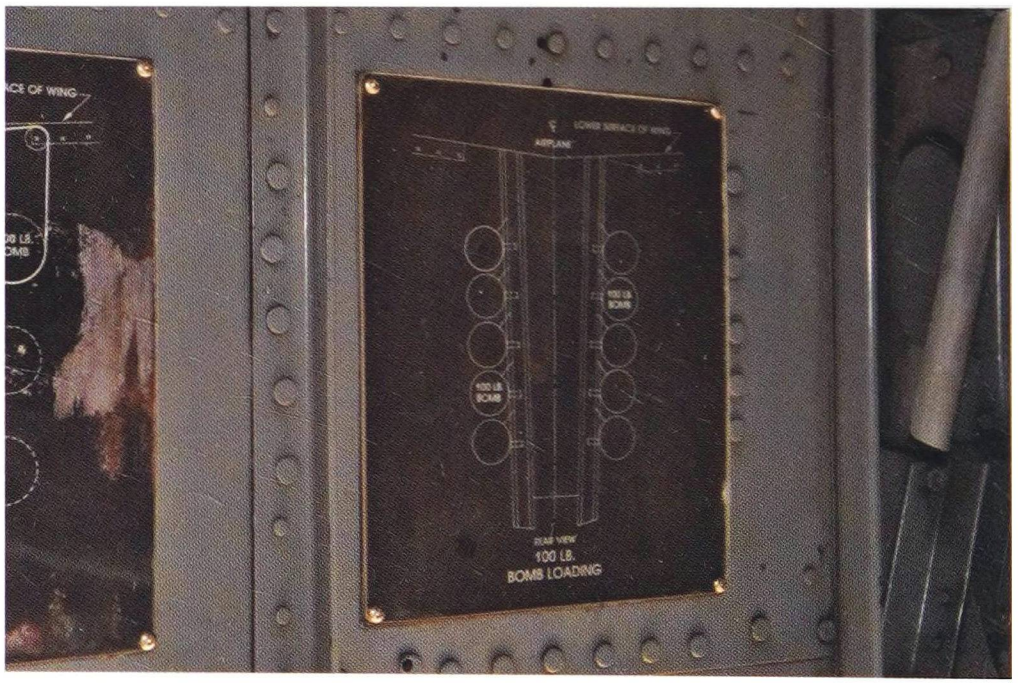


On the outboard sides of the partial bulkhead between the forward and aft bomb bays are sprockets that propel the bomb bay doors on their tracks. On the vertical frame of the bulkhead to the left is the hand crank to open the bomb bay doors if the power failed.

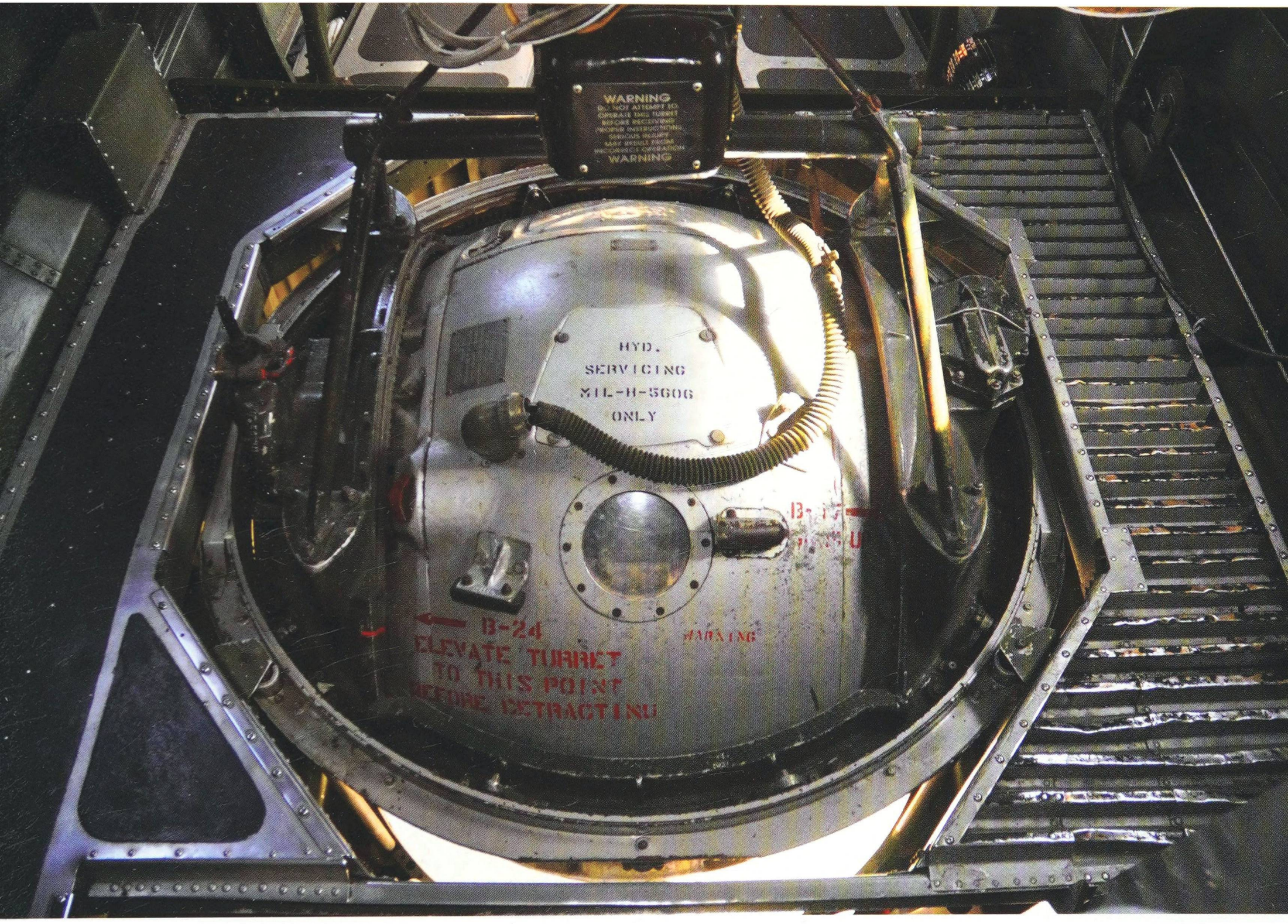


Below the fire extinguisher on the aft bomb bay bulkhead is an informational placard on how to hoist 300-pound bombs onto the bomb racks. The B-24 could carry up to twenty-two bombs in various combinations, from 100-pound bombs up to 2,000-pounders. *Chris Hughes*

On the right side of the rear bulkhead of the aft bomb bay is a fire extinguisher, below which, at the bottom of the photo, is the aft right bomb bay door sprocket. To the right, the retracted ball turret and the waist machine gun station are visible through the door.



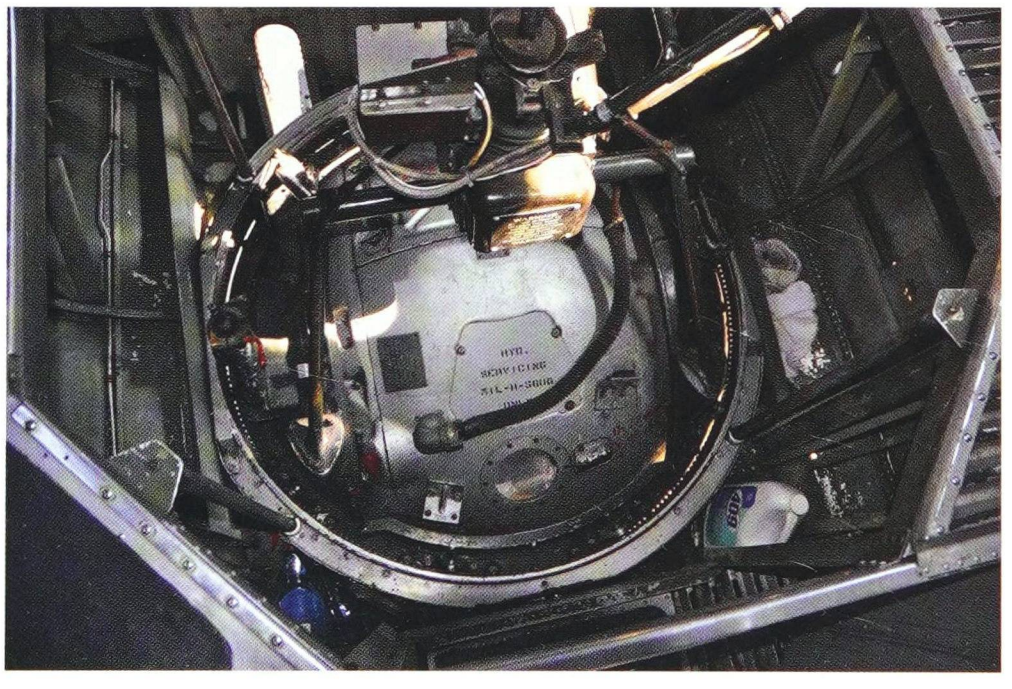
Next to the placard in the preceding photo is a placard illustrating the hoisting of 100-pound bombs. When 100-pound bombs were loaded in the B-24, the capacity was twenty bombs. The tops of the bomb racks were attached directly to the wing structure. *Chris Hughes*



The ball turret, viewed facing aft, is retracted. A flexible oxygen hose is coupled to the turret. Supporting the ball housing are two hangers shaped like inverted Vs. The tops of the hangars are attached to a cross-member below the black box with the "warning" sign. *Chris Hughes*

Above the ball turret hanger assembly are a vertically mounted hydraulic retraction cylinder and piston, for raising and lowering the turret assembly. A hand-cranked hydraulic pump was available for retracting the turret if the hydraulic system failed. *Chris Hughes*

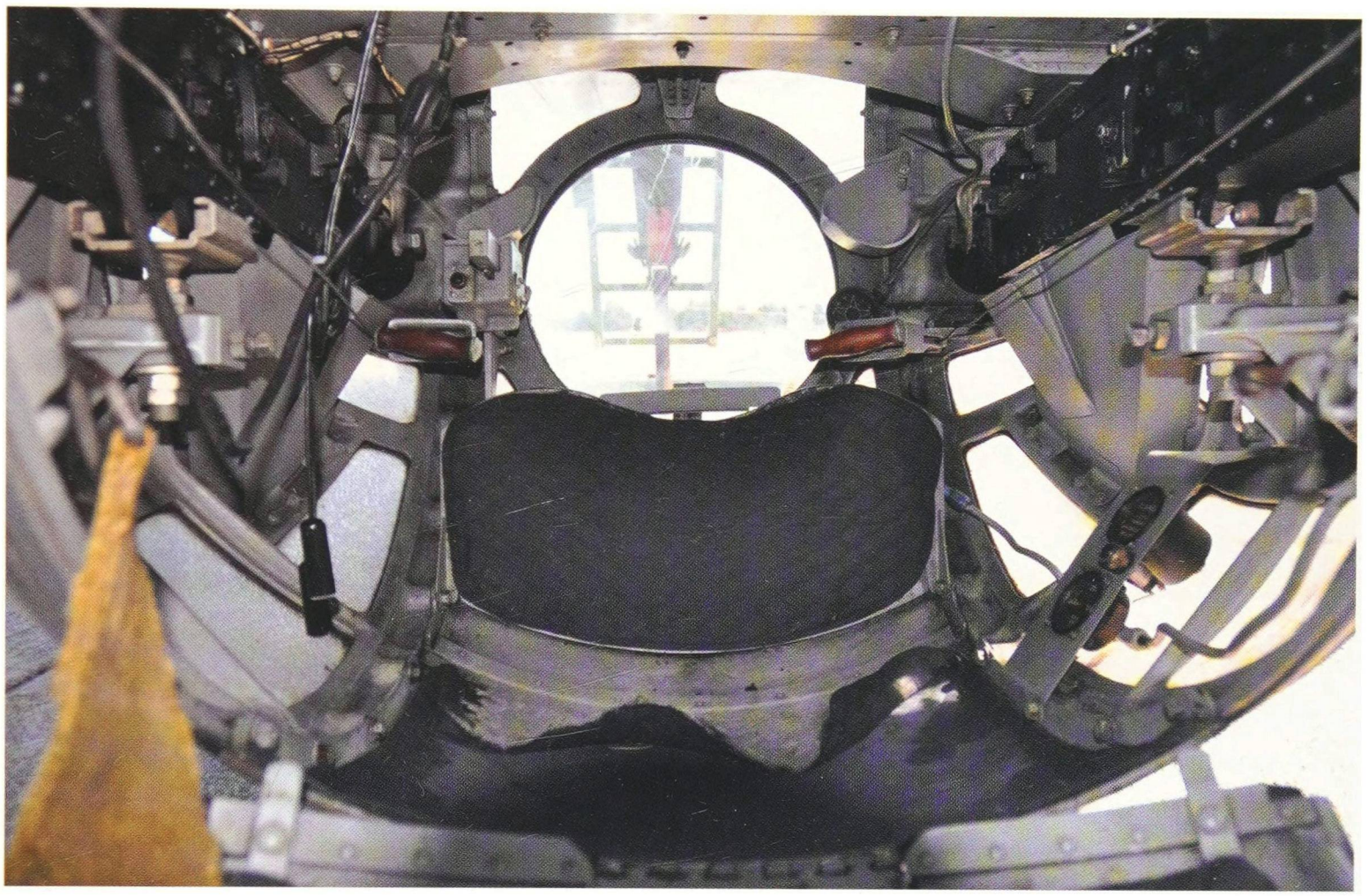
With the ball turret traversed aft, in the foreground is the upper front of the ball, with the door into the rear of the bomb bay and a yellow oxygen bottle in the background. The panel on the turret with the X-shaped reinforcing is the door for the ammunition boxes.

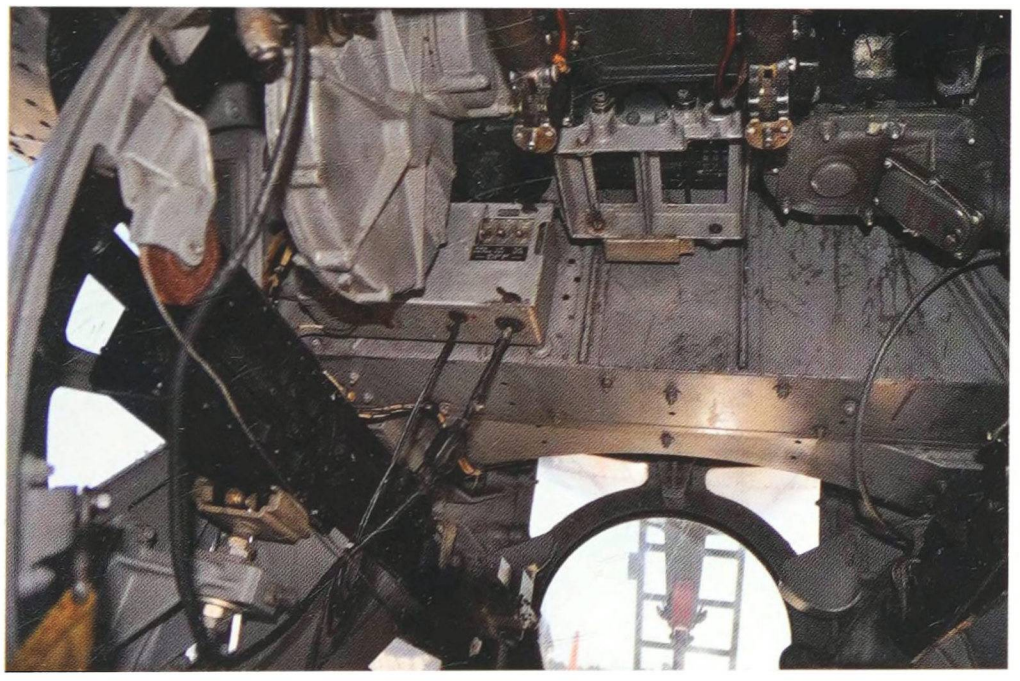


Looking down at the retracted ball turret, the recesses in the belly of the plane for the machine gun barrels are the light-colored slots. The top of the turret is visible; for the gunner to enter the turret, the turret was depressed; his door is out of view to the bottom. *Chris Hughes*

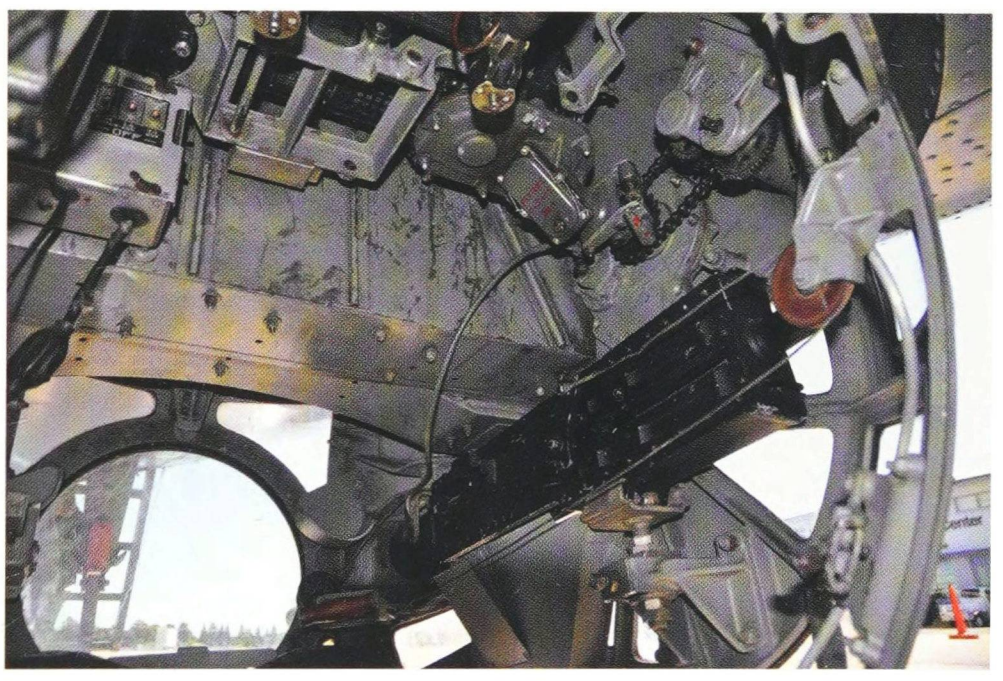
The interior of the ball turret gunner's access hatch formed a seat back for the gunner when closed and is fitted with a quilted cushion. The door-locking latches are in the foreground. Lying on the door is the safety belt. Inside the turret is the gunner's armor. *Chris Hughes*

The interior of a ball turret is viewed through the gunner's access door. The gunner sat in a semireclining, curled-up configuration, sighting the guns (*visible at the top*) through the round window. Below the window is an armor plate with quilted padding. *Chris Hughes*



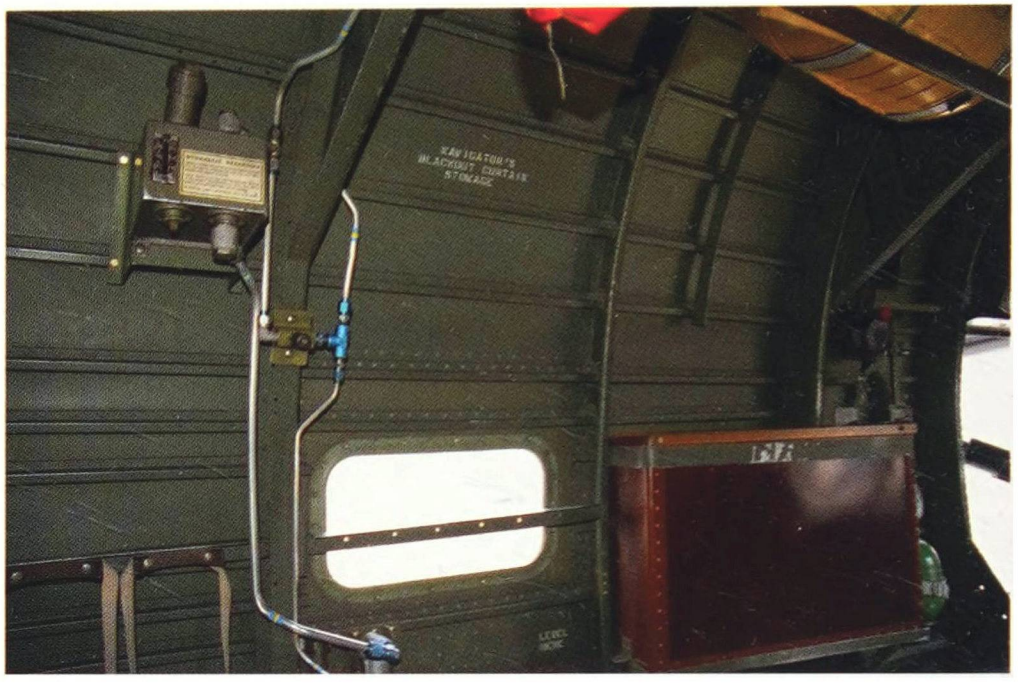


The upper part of the interior of a ball turret is displayed. Above the left machine gun is the manual elevation gearbox, to the front of which is the switch box for the machine guns. The computing sight, normally mounted at the top center, is dismounted. *Chris Hughes*

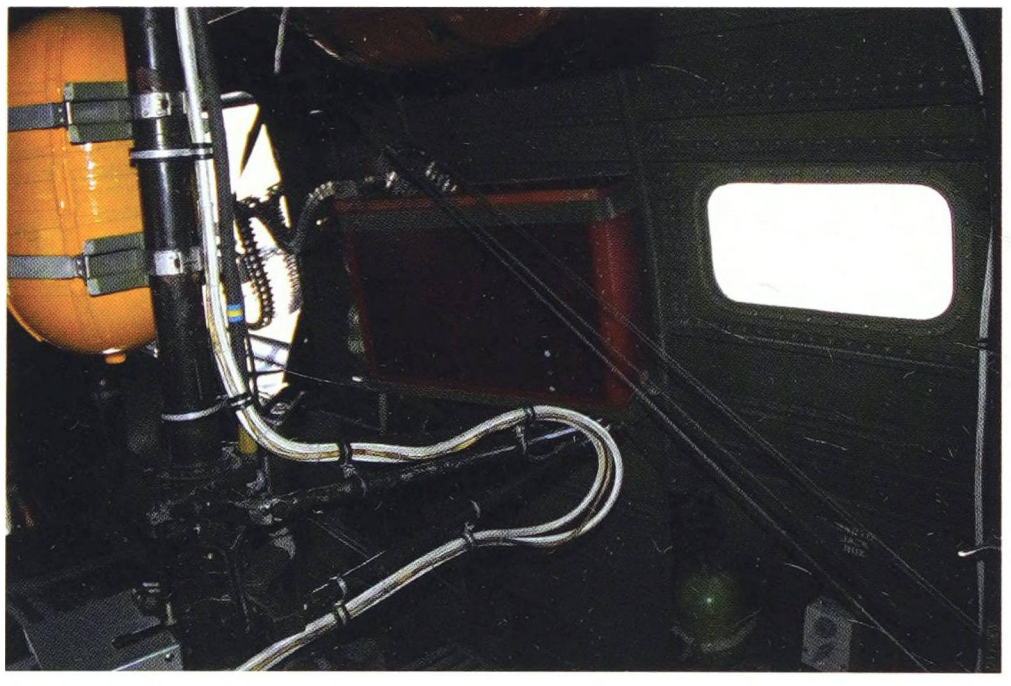


The gears and roller chain above the right machine gun to the upper right are part of the manual traverse mechanism, used in the event of power failure. To the right is a pulley for the gun-charging cable; the brown handle for the cable is next to the round window. *Chris Hughes*

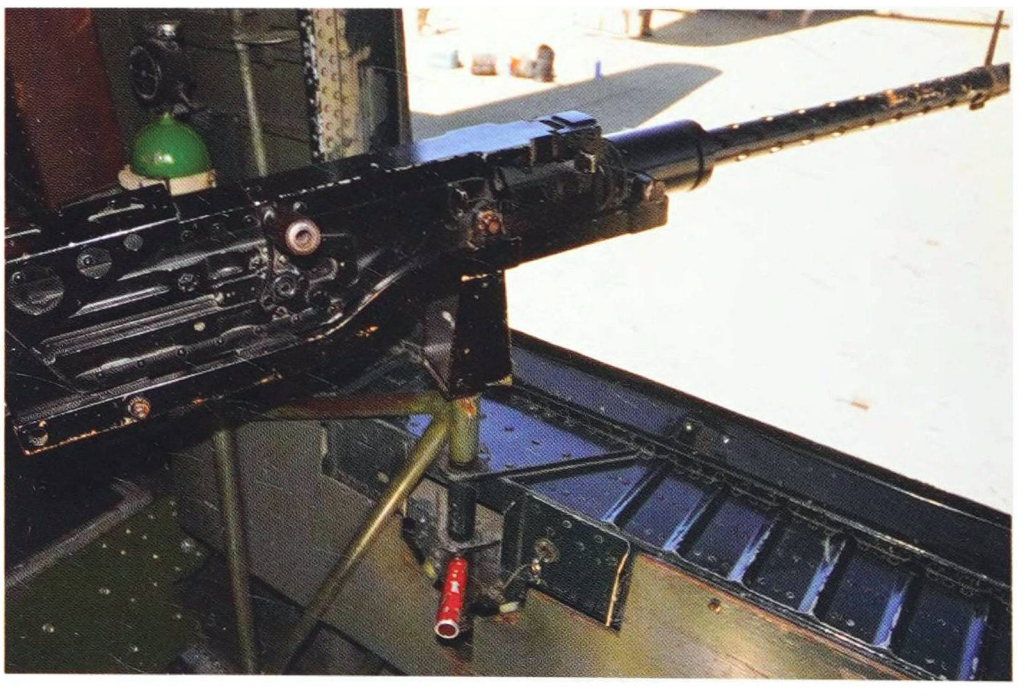
From the waist compartment of "Witchcraft," facing forward, to the right are yellow oxygen bottles for the ball turret, while to the left is the ammunition box and flex chute for the left waist .50-caliber machine gun along with green-colored portable oxygen bottles.



The small window on the right side of the fuselage forward of the waist machine gun window is viewed from inside. To the lower right is the ammunition box for the right waist machine gun, and to the upper left is a hydraulic reservoir for the ball turret.

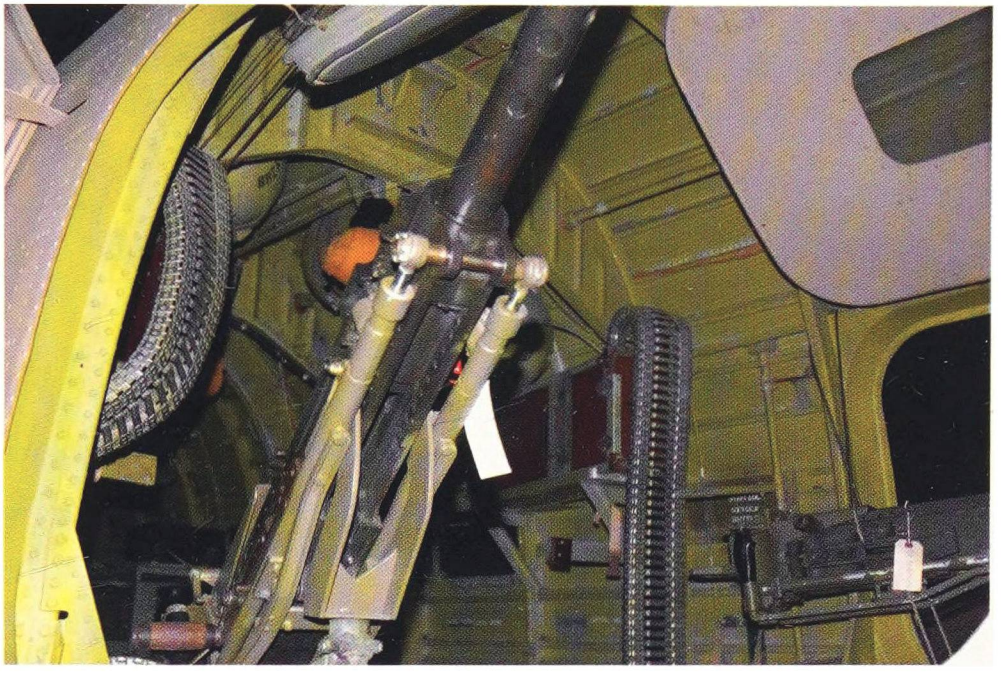


The support assembly and oxygen bottle for the ball turret are to the left in this view facing aft. The ammunition box for the left waist machine gun is in the background. At the top center is another oxygen bottle, and at the bottom right is a radio jack box.



The right .50-caliber waist machine gun of "Witchcraft" is on a simple pintle mount. The gun is attached to an adapter, a frame that acts as a cradle for the gun and a place to mount the grips. Jutting out from the side of the receiver is the charging handle. *Chris Hughes*

The left .50-caliber waist machine gun points out through the waist window. The left grip is visible on the rear of the adapter. Above the receiver of the gun is the flex chute, through which ammunition passed from the box in the background to the gun. *Chris Hughes*



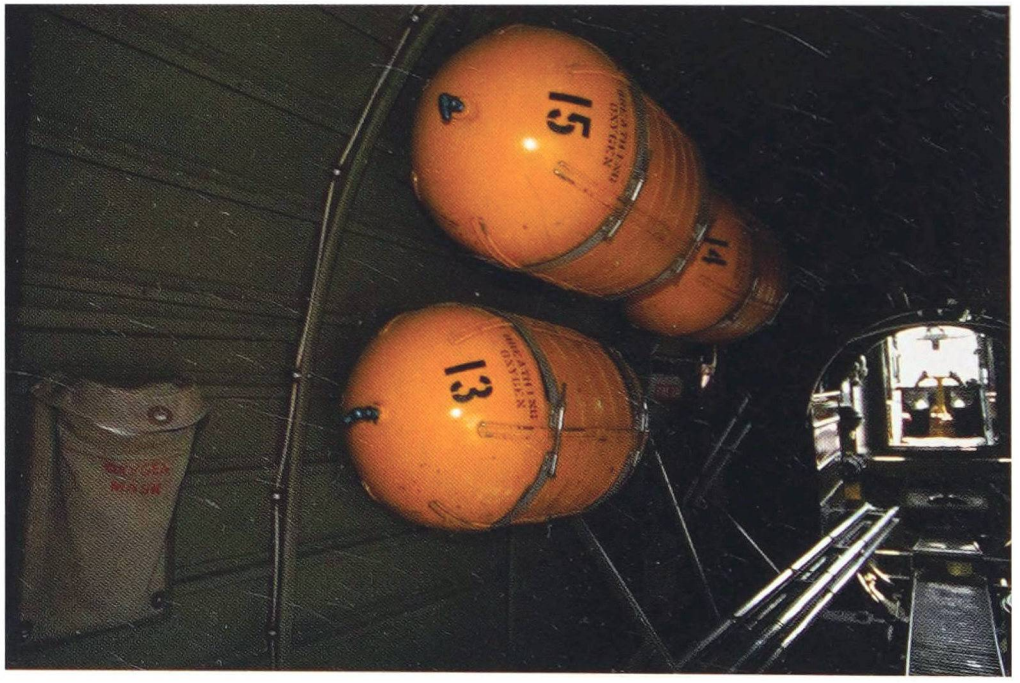
Details of the B-24D adapters of the left waist machine gun (*foreground*) and the right waist machine gun (*background*) are presented. At the center are the ammunition box and flex chute for the right gun, and at the top are the waist windows in their open positions.

The adapter used in the B-24D on display in Dayton is of a different type than the one in the preceding photo, having tubular sides that provided buffering for the recoil of the gun. Below the oxygen bottle are control boxes for oxygen, intercom, and a heated suit.

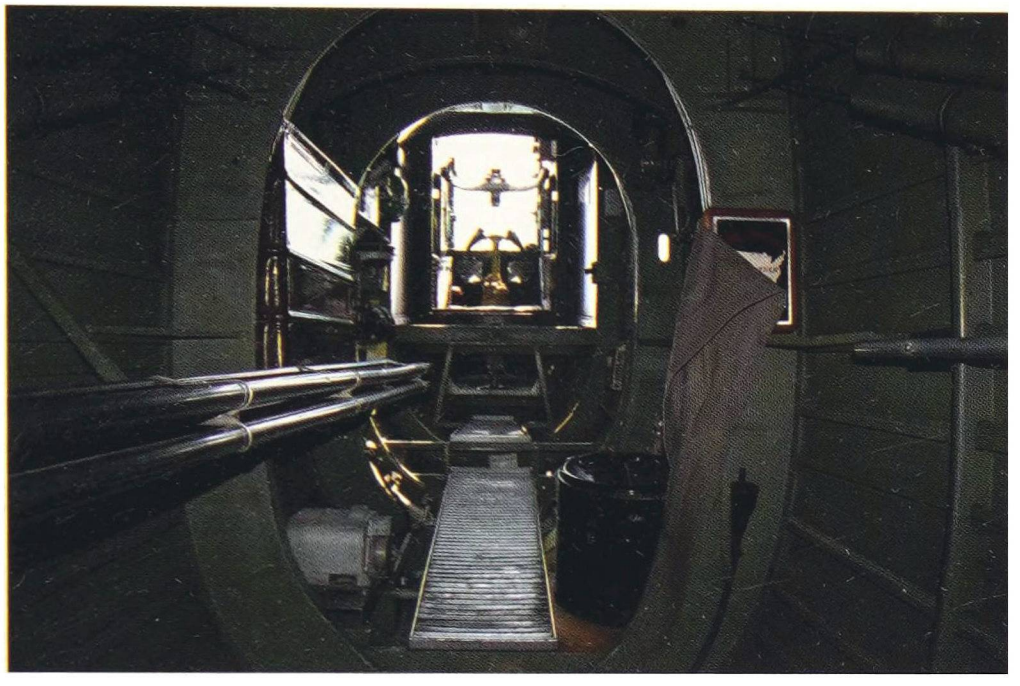
One of the waist windows is shown in the open position. It is hinged at the top and is latched to the upper part of the waist compartment. The red rectangular panel on the blue-and-white national insignia on the window is an external latch-release handle. *Chris Hughes*

Immediately aft of the waist windows are plywood ammunition boxes for the tail turret. Indicators on the sides of the boxes enabled crewmen to see how many rounds remained in the boxes. A placard on the lower box provided loading instructions. To the upper left is the rear of the right waist window, and to the lower right is the open escape hatch in the belly of the aircraft, with the hatch door secured above the hatch.

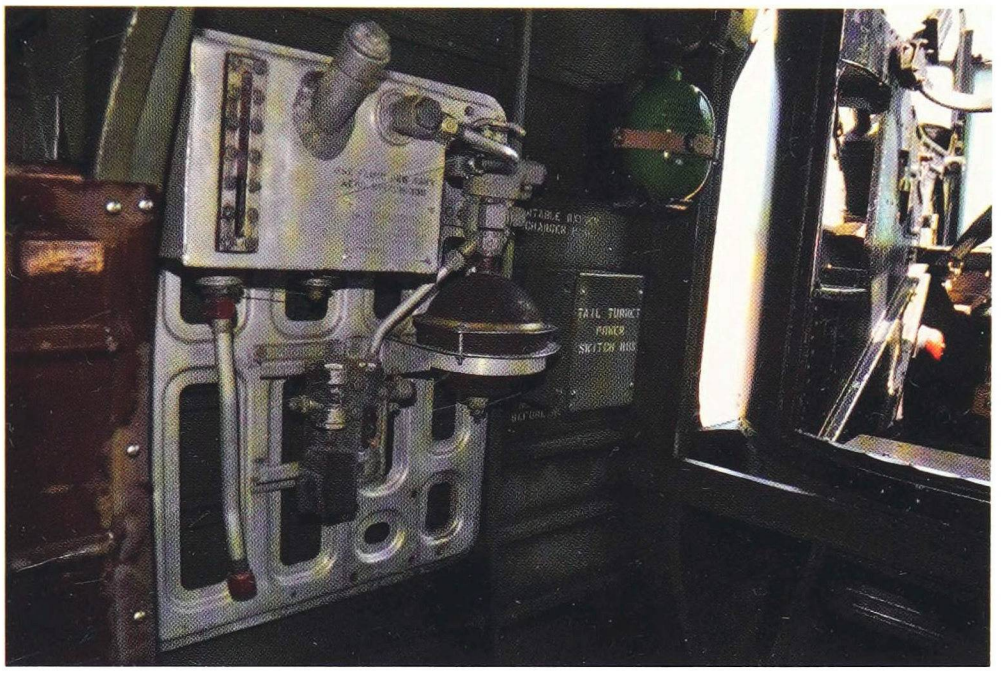
Aft of the waist machine gun stations, fixed breathing-oxygen bottles are mounted on the left side of the fuselage. These bottles delivered oxygen to regulators to which the crewmen attached the hoses of their oxygen masks. The tail turret is in the background.



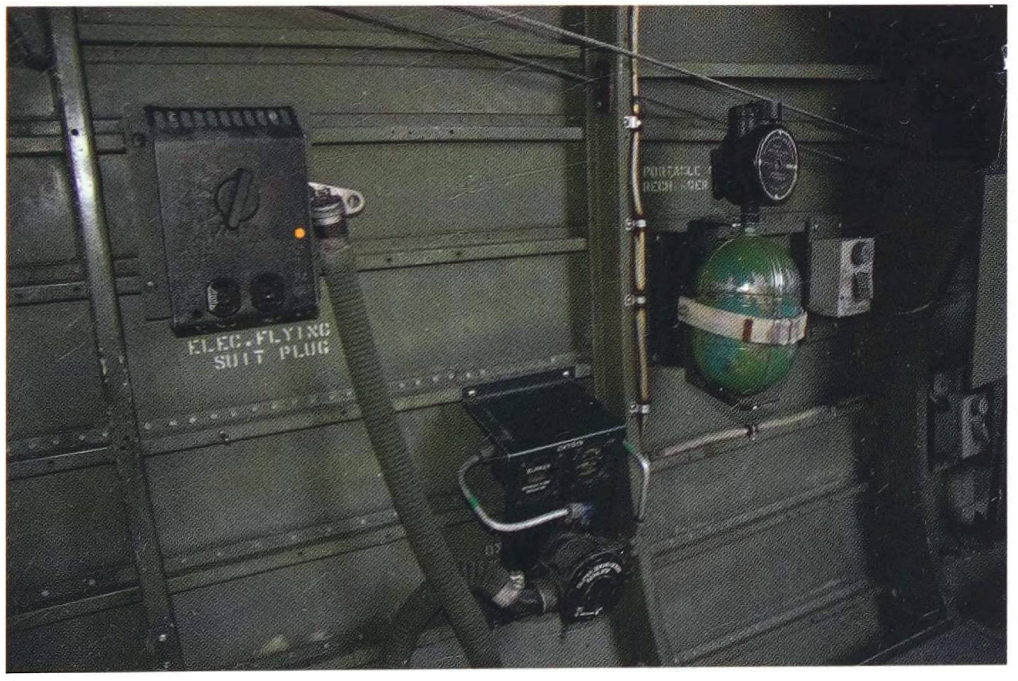
Three more oxygen bottles are on the right side of the fuselage aft of the waist windows. The bottles are secured in place with straps with clamp-type tighteners. Plumbing for the oxygen lines is not present. To the left is a canvas holder for a crewman's oxygen mask.



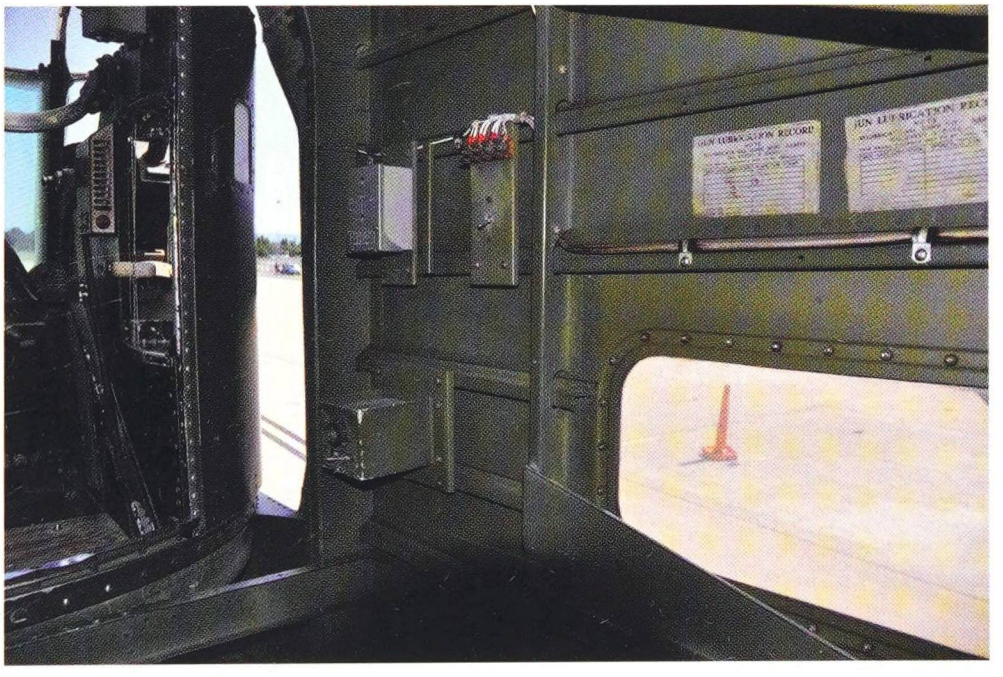
Facing aft into the rear of the fuselage, with the tail turret in the center background, to the left are two rigid ammunition feed chutes for the two .50-caliber machine guns in the tail turret. At the center are slatted metal catwalks for accessing the tail turret.



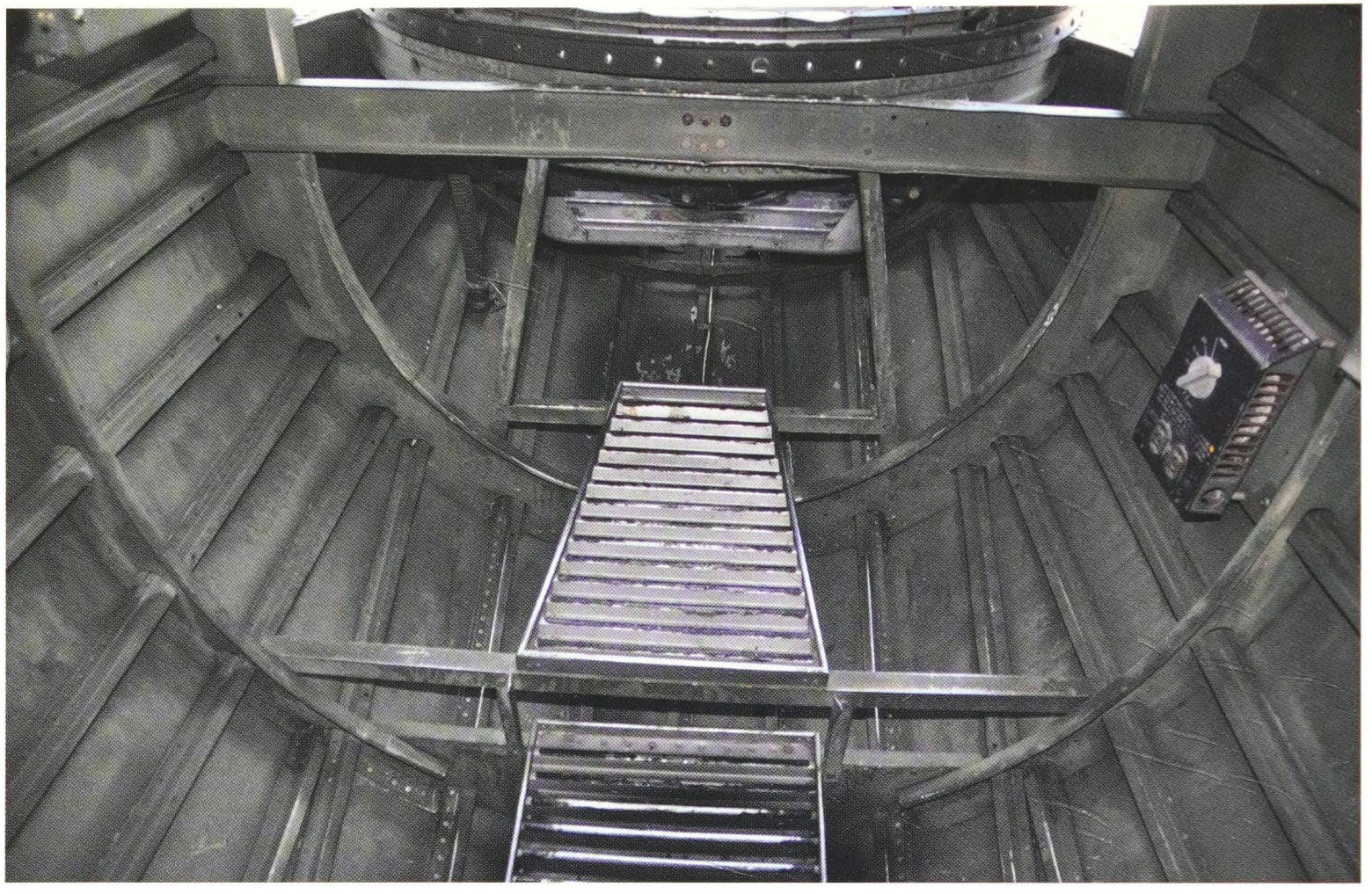
The tail turret was powered by its own hydraulic system, separate from the main hydraulic system, mounted on the right side of the fuselage forward of the tail turret. The system powered the rotation of the turret and elevation and charging of the guns. *Chris Hughes*



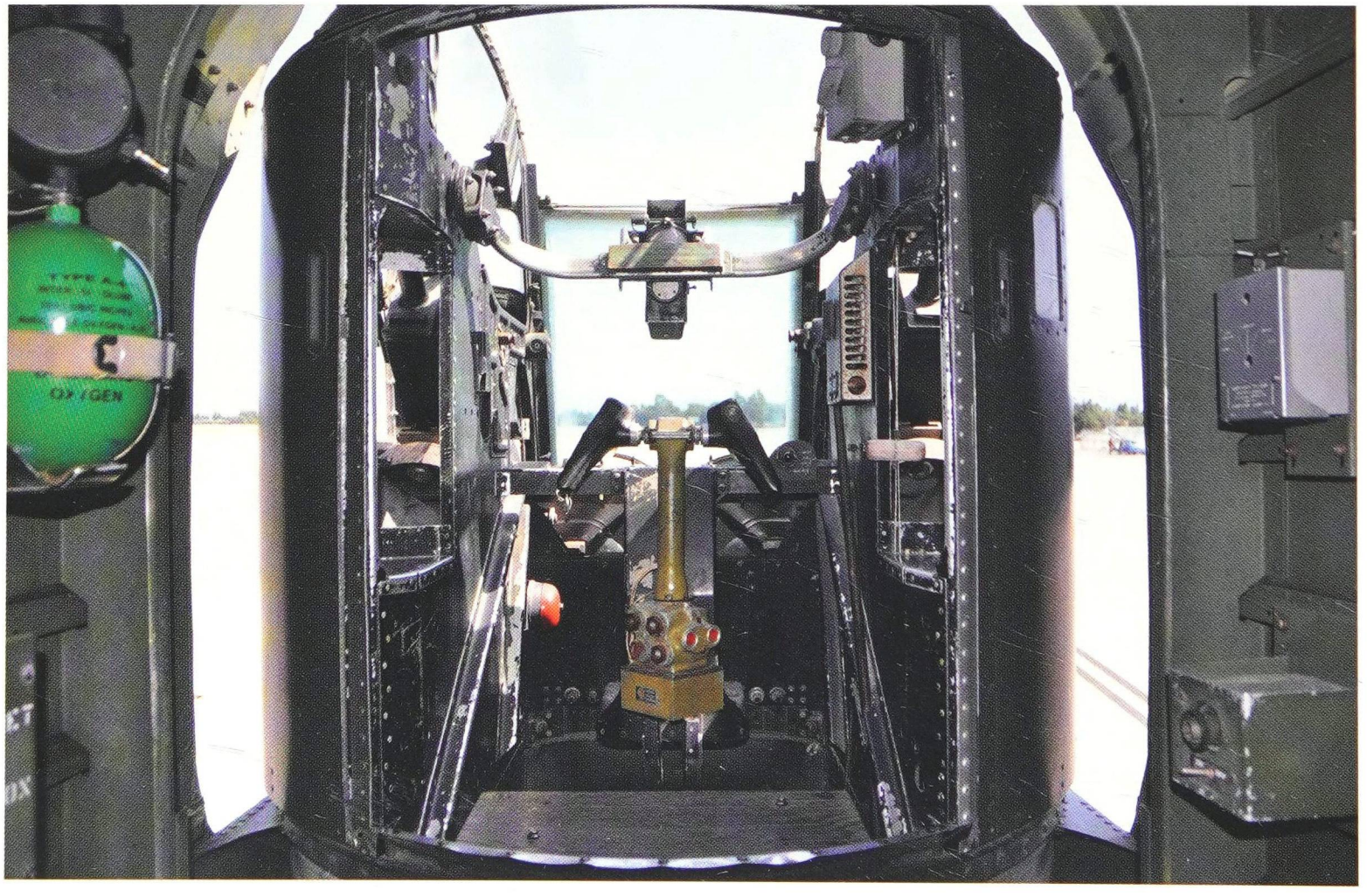
Arrayed in the rear of the fuselage near the tail turret are, *left to right*, controls and receptacles for an electrically heated flying suit; an oxygen hose and regulator; a portable oxygen bottle, secured with a webbing strap to a holder; and an intercom control box.



Opposite the tail-turret hydraulic equipment is a small window, above which are affixed charts for recording the dates that the tail-turret machine guns were lubricated; they were to be lubricated every five days. To the far left is the tail turret, with the gunner's door open. *Chris Hughes*

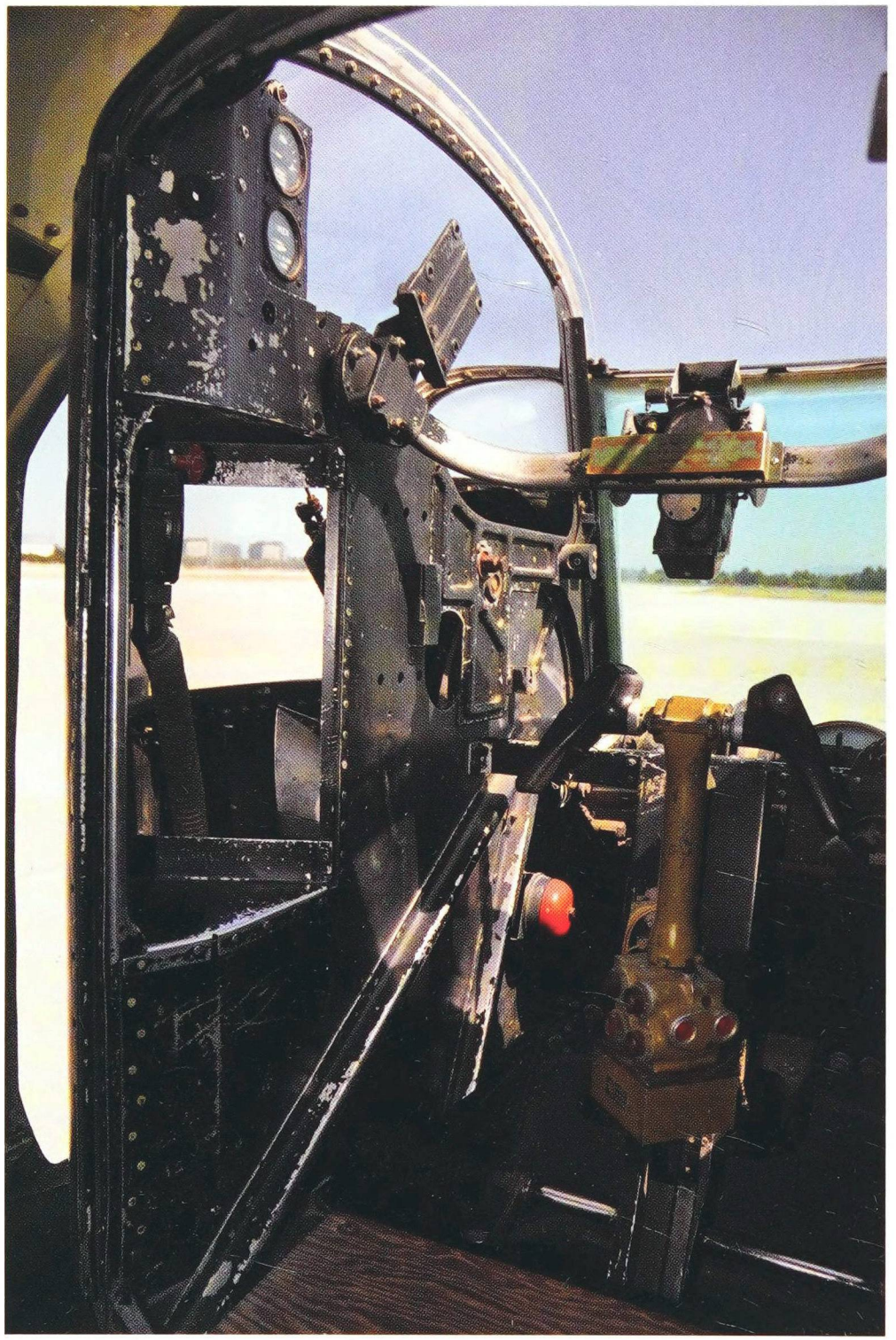


Catwalks were provided in the rear of the fuselage for the tail gunner to access his turret. They were of slatted design and were of staggered heights to allow for the curvature of the belly of the fuselage. To the right is a control and receptacles for a heated flight suit. *Chris Hughes*



Through the gunner's access door at the rear of the tail turret, details of the interior are visible. At the bottom is the seat, with the control column to the front of it. Above the controls is the yoke for the gunsight. At the upper right is an intercom control box.
Chris Hughes

To aim the guns, the tail gunner grasped the two grips on the control column and turned the handles from side to side to traverse the turret and rocked the handles up and down to elevate and depress the guns. Each grip had a firing trigger under the index finger. *Chris Hughes*

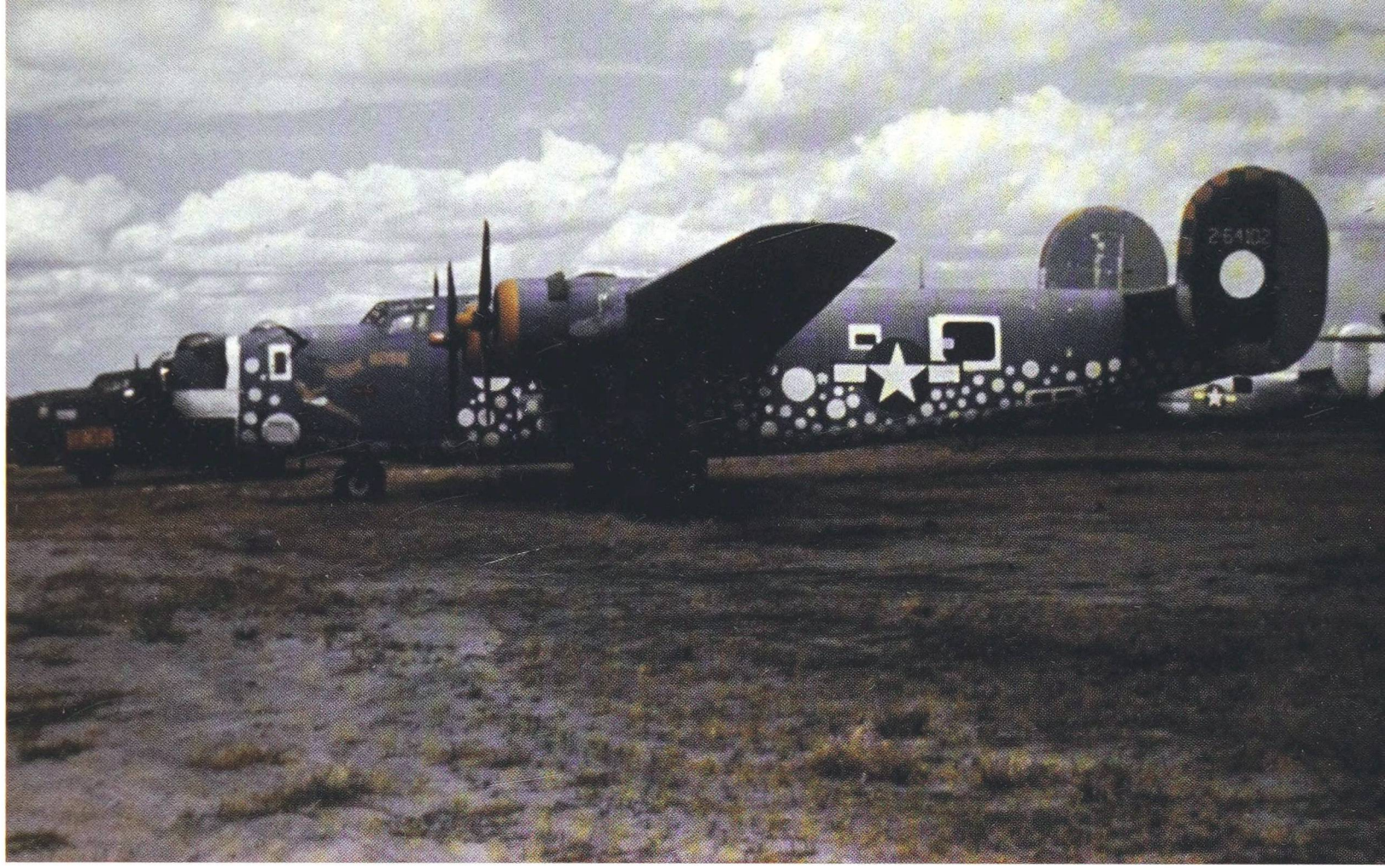


In a view of the left side of the interior of the tail turret, at the top are gauges for the gunner's oxygen. The left machine gun is outboard of the black bulkhead to the left of the control column. The gunsight yoke moved up and down in unison with the guns. *Chris Hughes*

The right side of the tail turret's interior is shown. At the top is the right side of the gunsight yoke. Below it are the gunner's controls and receptacles for his heated flight suit. To the right of those controls, the rear of the right .50-caliber machine gun is visible. *Chris Hughes*

CHAPTER 5

F-7A/B



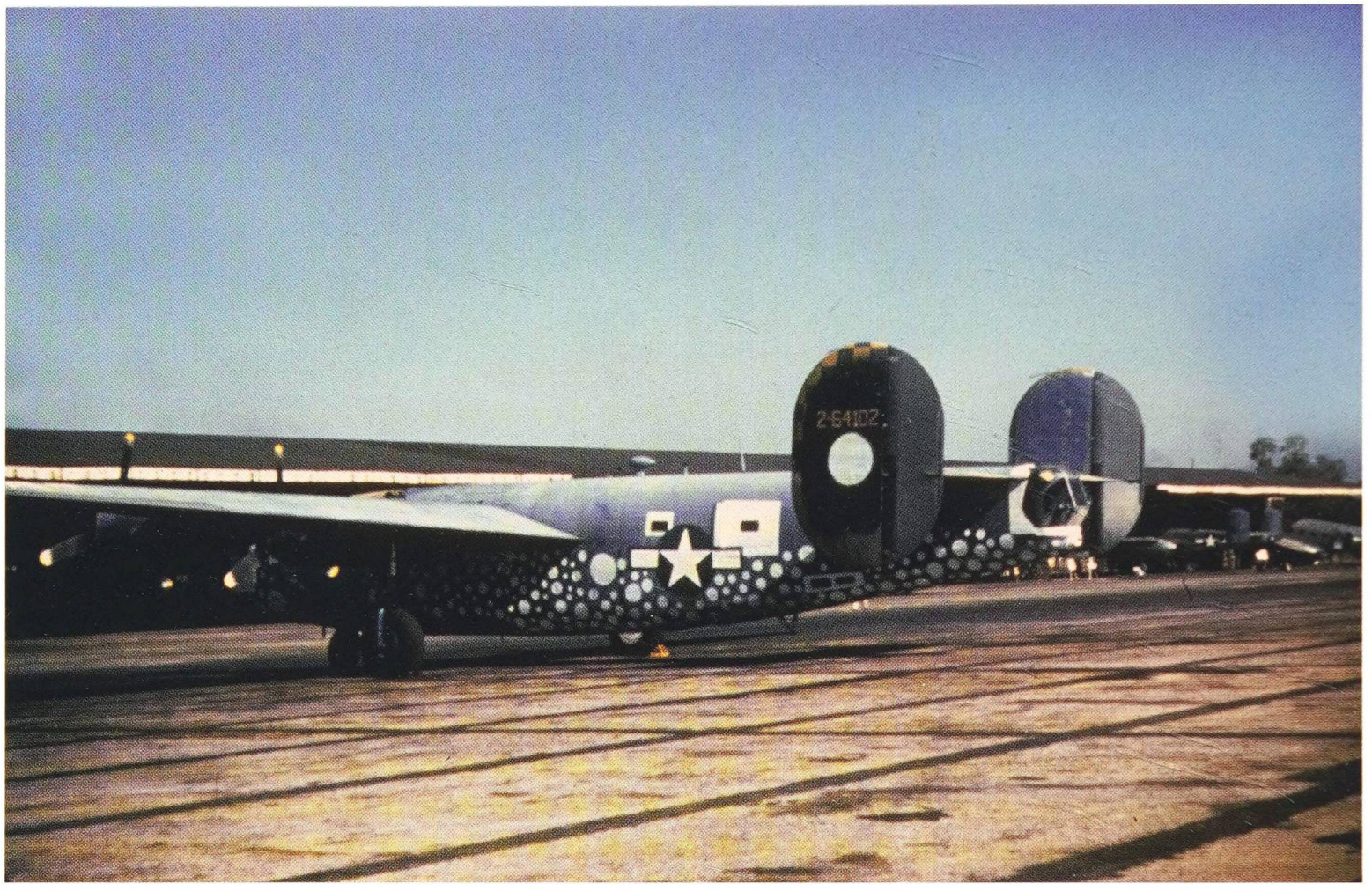
"Nosie Rosie" was an F-7A, a conversion of a B-24J to a photoreconnaissance plane. It served with the 24th Combat Mapping Squadron of the 10th Air Force in the China-Burma-India theater. The plane was disarmed and had auxiliary fuel tanks and vertical cameras in the aft bomb bay. *Stan Piet collection*

Some B-24Js, as well as B-24L and M, were converted to photoreconnaissance aircraft. The first of these were designated F-7A. During the conversion, a trimetrogon camera array was installed in the nose. A trimetrogon camera array is actually three cameras in one assembly. One of these aimed directly downward, and the other two were focused at 30 degrees of depression along either side of the flight path, allowing the use of stereographic interpretation of the images captured. This made the aircraft ideally suited for mapping.

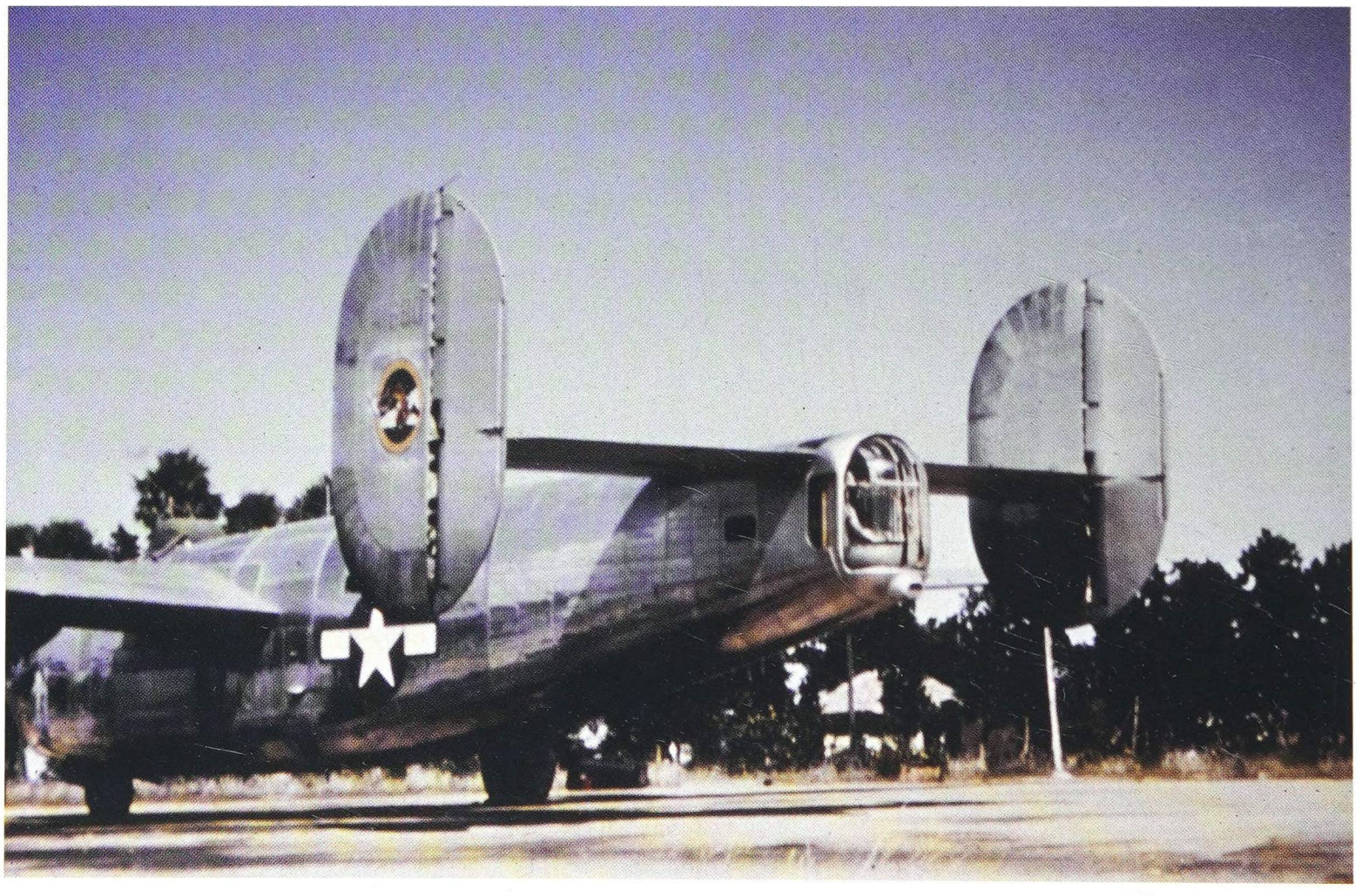
In the aft bomb bay, a pair of vertical cameras were mounted, as well as a position for the camera operator. Typically, the forward bomb bay was filled with auxiliary fuel tanks.

The later F-7B, converted from 122 B-24J and 2 B-24M bombers, mounted five cameras in the aft bomb bay and none in the nose.

With about eighty-nine F-7As and 124 F-7Bs converted, they were assigned to a number of groups. Among them were the 1st Photographic Group, 4th Photographic Group, 5th Photographic Group, 6th Photographic Group, 11th Photographic Group, and 311th Reconnaissance Wing.



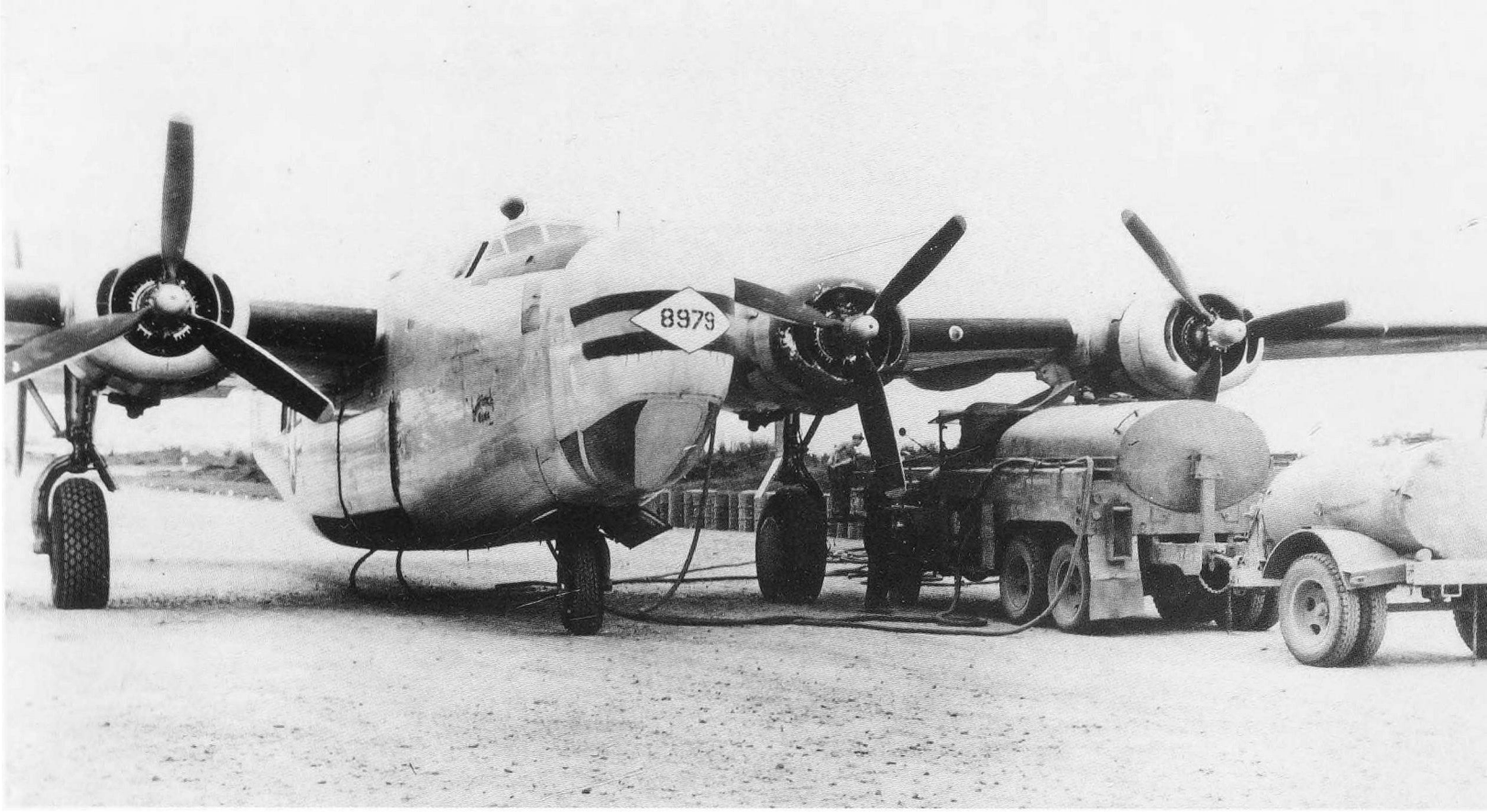
The .50-caliber machine guns had been removed from the tail turret of F-7A "Nosie Rosie" when it was photographed in Shanghai, China, after the end of World War II. It appears that the top turret has been removed and the opening plated over. Just visible below the bomb bays are a pair of T-shaped antennas for the radio altimeter. *Stan Piet collection*



While most F-7Bs were converted from B-24M aircraft, some were converted from J and L models. This F-7B began life as B-24L-15-CO, serial number 44-41680. Visible on the former aft bomb bay door is the aft port camera window. At the rear of the aircraft is a lightweight, unpowered Convair M-6A "stinger" installation with handheld twin .50-caliber machine guns, which was installed in some B-24Ls. *Stan Piet collection*

CHAPTER 6

C-109



Named for the Detroit-recorded 1939 country tune about the Polish portion of Hamtramck, Michigan, "Hamtramck Mama," serial number 44-48979, was converted from a Ford B-24J-20-FO Liberator. "Hamtramck Mama" survived the war and was disposed of on November 15, 1945.

Supplying fuel to aircraft and vehicles was a major concern for all military forces during World War II, and for the United States the issue was particularly crucial in connection with the need to supply adequate aircraft fuel to big Boeing B-29 bombers operating out of the remote China-Burma-India (CBI) theater. To ensure that fuel kept flowing, it was decided to convert 2,000 existing B-24J bombers to fuel transports, which would then be designated C-109s.

Modification centers across the United States carried out these conversions, which, as a rule, involved stripping the planes of all their armament and then filling the void with six new fuel tanks. So equipped, each C-109 had a carrying capacity of 2,900 gallons of fuel. The C-109, it might be noted, was purely a fuel transporter; unlike the USAF airborne tankers of the Cold War and modern eras, the C-109 had no ability to carry out midair refueling of aircraft.

After modification, the C-109s were dispatched to fronts around the world. Most found their way to the CBI theater to help supply thirsty B-29s, but a few of the fuel transports did wind up in Europe.

Aircrews were less than enthusiastic about the tankers, since the shift from bomber configuration to fuel transport redistributed weight in the aircraft and resulted in longitudinal instability. Moreover, a fully loaded C-109 fuel transport was heavy and hard to land, especially at airfields higher than 6,000 feet in elevation, and the weight often overtaxed nose gears. Late in 1944, however, the Twentieth Air Force relocated its B-29s from the CBI to the Marianas, in the Pacific, and C-109s were no longer needed. Accordingly, after a few more than 200 B-24Js had been turned into fuel transports, the conversion program was brought to a close.

"White Angel," a C-109 converted from a Ford B-24L-1-FO Liberator, serial number 44-49059, suffered a landing accident in Tezgaon, India (now Bangladesh), on November 2, 1944. Seemingly cursed, on August 27, 1945, the C-109 suffered a ground loop at the air base at Luliang, Yunnan Province, China.

Small camels were painted on the left nose of "White Angel" to represent supply missions over "the Hump" (the Himalayan mountain range). The tanker was assigned to the 1st Transport Squadron. *National Museum of the United States Air Force*

CHAPTER 7

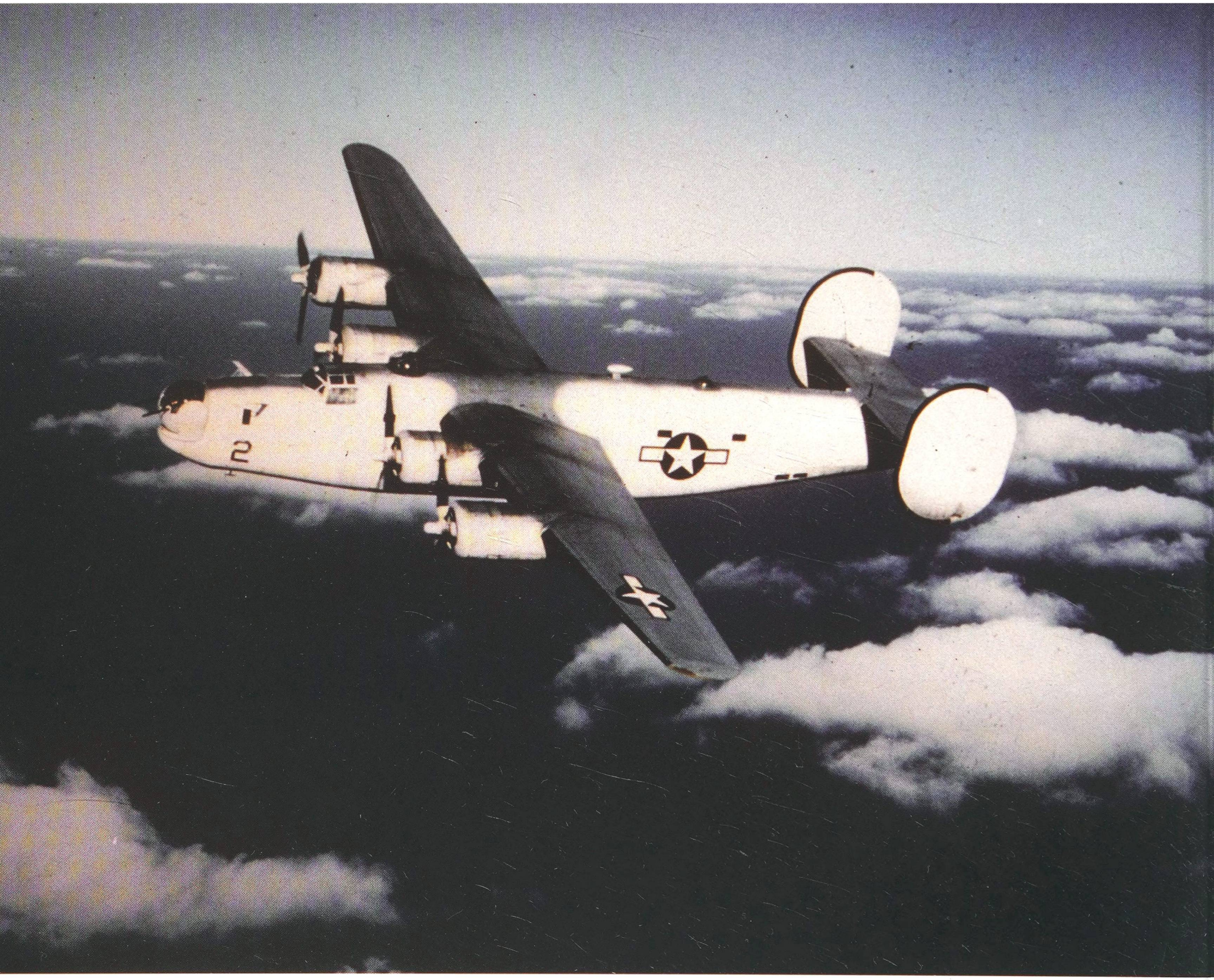
PB4Y-1

The magazines of ERCO 250SH-2 nose turret used on PB4Y-1s held 1,300 rounds of .50-caliber ammunition. Visible on the upper left of the turret is the trunnion, which supported the ball of the turret. The turret elevated and depressed on the trunnions, while the base, including the trunnions, rotated. *National Archives*

All Navy Liberators came from contracts originally placed by the Army, and were designated PB4Y-1, regardless of the model number of the base aircraft. Thus, whether they were B-24D, G, J, L, or M models, to the Navy they were PB4Y-1s. The Navy's acquisition and use of the Liberators, which they used for antisubmarine patrols, was a result of a deal negotiated for the use of the Navy-owned, Boeing-operated plant in Renton, Washington, which the Army wanted for B-29 production. Prior to this deal, the Navy had been denied authority to operate land-based bombers.

Following the initial deliveries of B-24Ds in US Navy paint and markings, the Navy accepted numerous G, J, L, and M models as well.

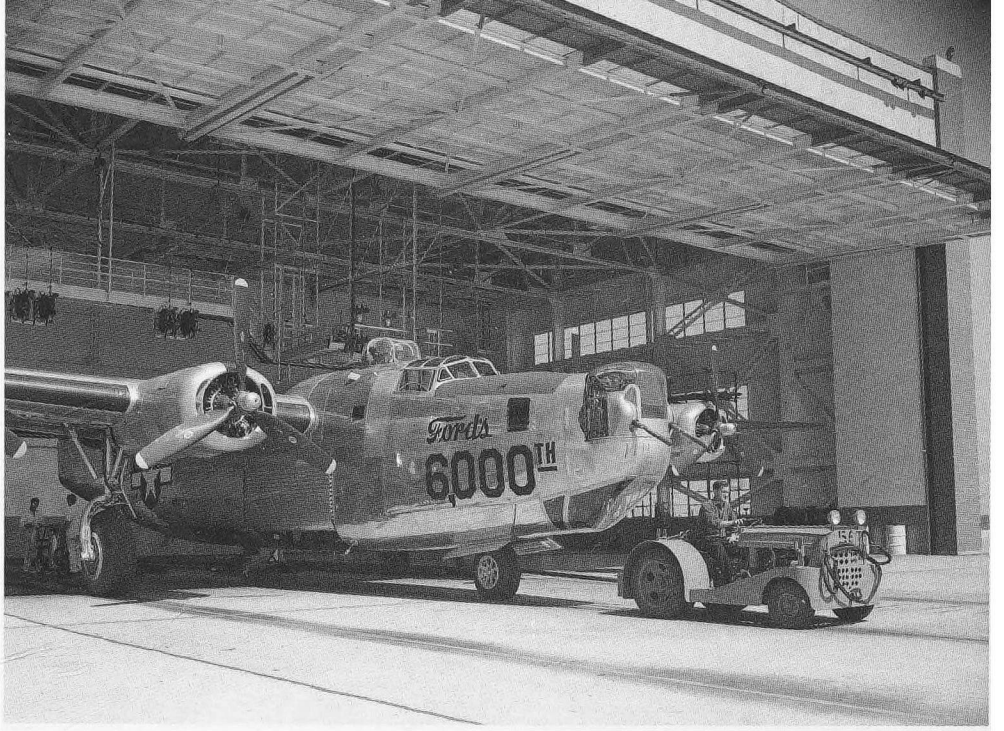
While many of these aircraft had the Consolidated or Emerson nose turrets, Consolidated tail turrets, and Martin top turrets typical of B-24 production, during production a number of the aircraft were equipped with Engineering and Research Co. (ERCO) 250SH-2 nose ball turrets. The ERCO turret, which was not used by the Army Air Force at all, was a 54-inch-diameter sphere. The top of the 250SH-2 was Plexiglas and housed the gunner, his sight and controls, and two .50-caliber heavy machine guns. The bottom of the sphere was attached to a cast magnesium-alloy rotating base and trunnions.



This PB4Y-1 displays the wartime antisubmarine camouflage scheme of Dark Gull Gray on the tops of the wings, horizontal stabilizer and elevators, and center top of the fuselage. The balance of the aircraft is painted Insignia White. A small observation dome is aft of the football-shaped RDF antenna.
National Archives

CHAPTER 8

B-24L



Produced by Consolidated and Ford, the B-24L was designed to reduce the weight of the Liberator, which had become increasingly heavy with each new model. Most examples eliminated the ball turret in favor of two manually operated machine guns, and three lighter tail-armament options were available. Here, B-24L-1-FO, serial number 44-49219, is towed out of Willow Run. This aircraft was the 6,000th B-24 produced by the automaker, including knockdown kits provided to other plants for final assembly. The sliding window on the side of the cockpit of this aircraft was of a revised, bulged design instead of the earlier blister type. *Library of Congress*

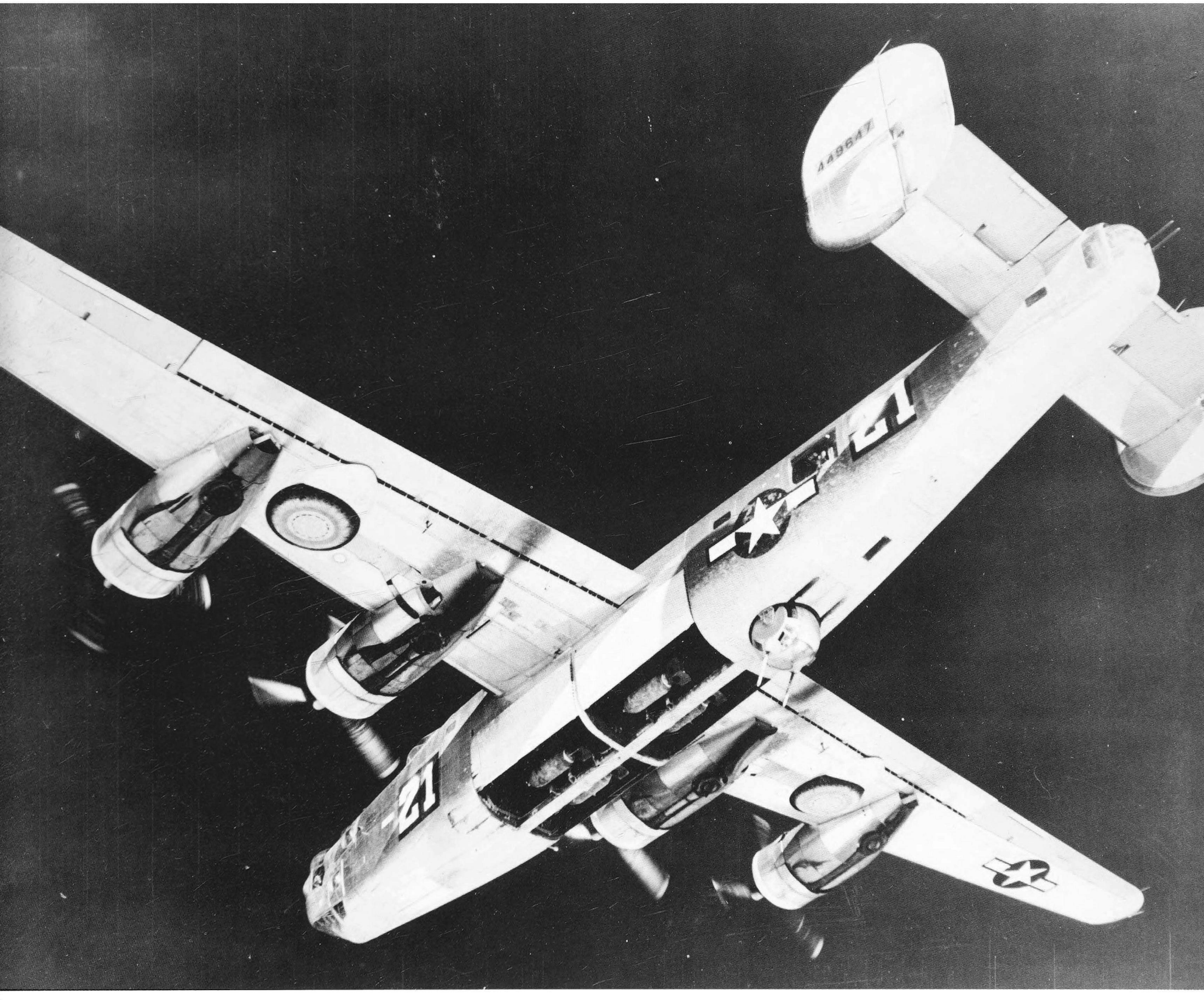
Whereas for much of the war, five plants churned out Liberators, in mid-1944 production of the type was confined to two facilities producing a single model. Those plants, Convair's San Diego facility and Ford's massive Willow Run plant, began production of the B-24L. As an aside, the K designation had been applied to the experimental single-tail XB-24K Liberator, which became the forerunner of the PB4Y-2 Privateer.

The new B-24L, which entered production by Convair in July 1944, and by Ford in August, was a lighter aircraft than its immediate predecessors. Typical of combat equipment, the Liberator had gained weight since its inception through the addition of more armor and armament and other associated gear. The rear of the aircraft was particularly weight-sensitive, owing to the Liberator's delicate center of gravity and the Davis wing.

Counter to much of what has been previously written, newly uncovered original documents confirm that all B-24L aircraft (as well as B-24M aircraft) left the factory with ball turrets installed. However, some units in theater opted to remove the ball turret, in its place mounting a twin, ring-mounted .50-caliber machine gun installation in an effort to reduce weight.

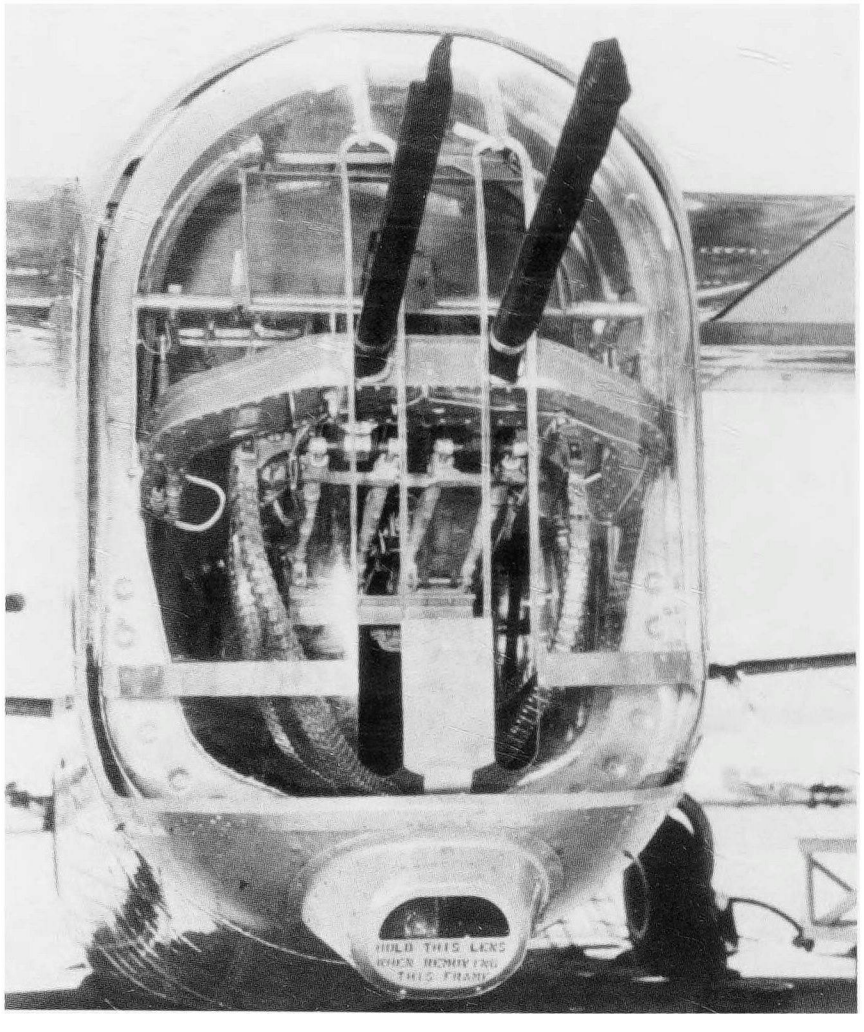
The gun installation that *did* change with the advent of the B-24L was the tail gun mounting. Specifically, tail guns were no longer installed at the factory. Instead, the rear armament would be installed at modification centers, with the type of armament determined by the requirements of the area the aircraft was being delivered to. The three options of rear armament were the Convair M-6A "stinger" mount, a hand-operated twin–machine gun mount, or the Consolidated A-6B turret.

B-24L-10-FO, serial number 44-49545, nears completion in the Willow Run plant. On July 10, 1944, the USAAF directed that Ford and Convair were to deliver B-24Ls without tail armaments. Accordingly, the tail turret locations of the aircraft seen here have aluminum fairings. The armament will be added at modification centers, according to the ultimate use of the aircraft. *Library of Congress*



B-24L-10-FO Liberator, serial number 44-49647, was assigned to the 724th Bomb Squadron, 451st Bombardment Group, 15th Air Force. Here, the bomber nears the release point over Vienna, with the bomb bay doors open and bombs clearly visible shackled inside. *National Archives*

The Royal Australian Air Force (RAAF) operated 287 Liberators of all types. Among these were eighty-three B-24Ls, including this one, RAAF serial number A72-118, originally USAAF serial number 44-41635. Protruding from the bottom of this aircraft, just forward of the bomb bay, is a radome. *National Museum of the United States Air Force*



One of the types of turret mounted at the rear of the B-24L was the Convair M-6A, shown here. The M-6A was installed on forty-one of the 417 B-24Ls built by the firm. The M-6A consisted of a Plexiglas housing with slots cut in, through which the .50-caliber guns protruded. The slots permitted the twin .50-caliber machine guns to elevate or depress, while the housing swiveled from side to side, allowing the guns to traverse. *National Museum of the United States Air Force*

CHAPTER 9

B-24M

New turrets, engines, and other additions to the Liberator meant that the weight of the aircraft tended to increase, making for a growing "weight problem" that began to interfere with the aircraft's performance. Aircraft that suffered combat damage were particularly affected. The B-24L was an attempt to address the weight issue: the ball turret was deleted and manually operated guns replaced the power-operated tail turret.

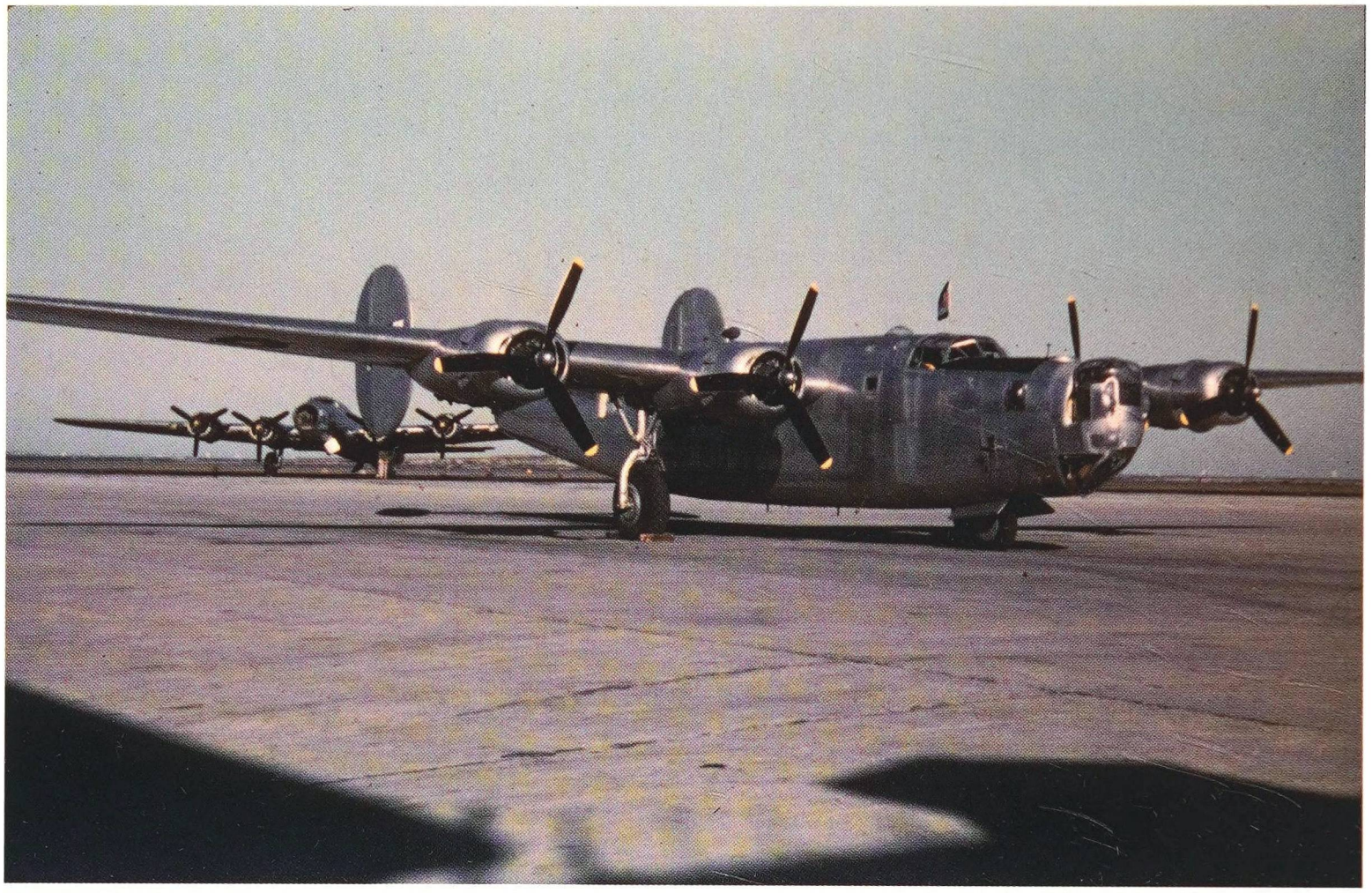
When a powered tail turret returned on the B-24M, it was a lightweight Consolidated A-6B. That aircraft's nose was also fitted with an Emerson power turret.

Ford, at its Willow Run plant, and Convair, in San Diego, began producing the B-24M in October 1944.

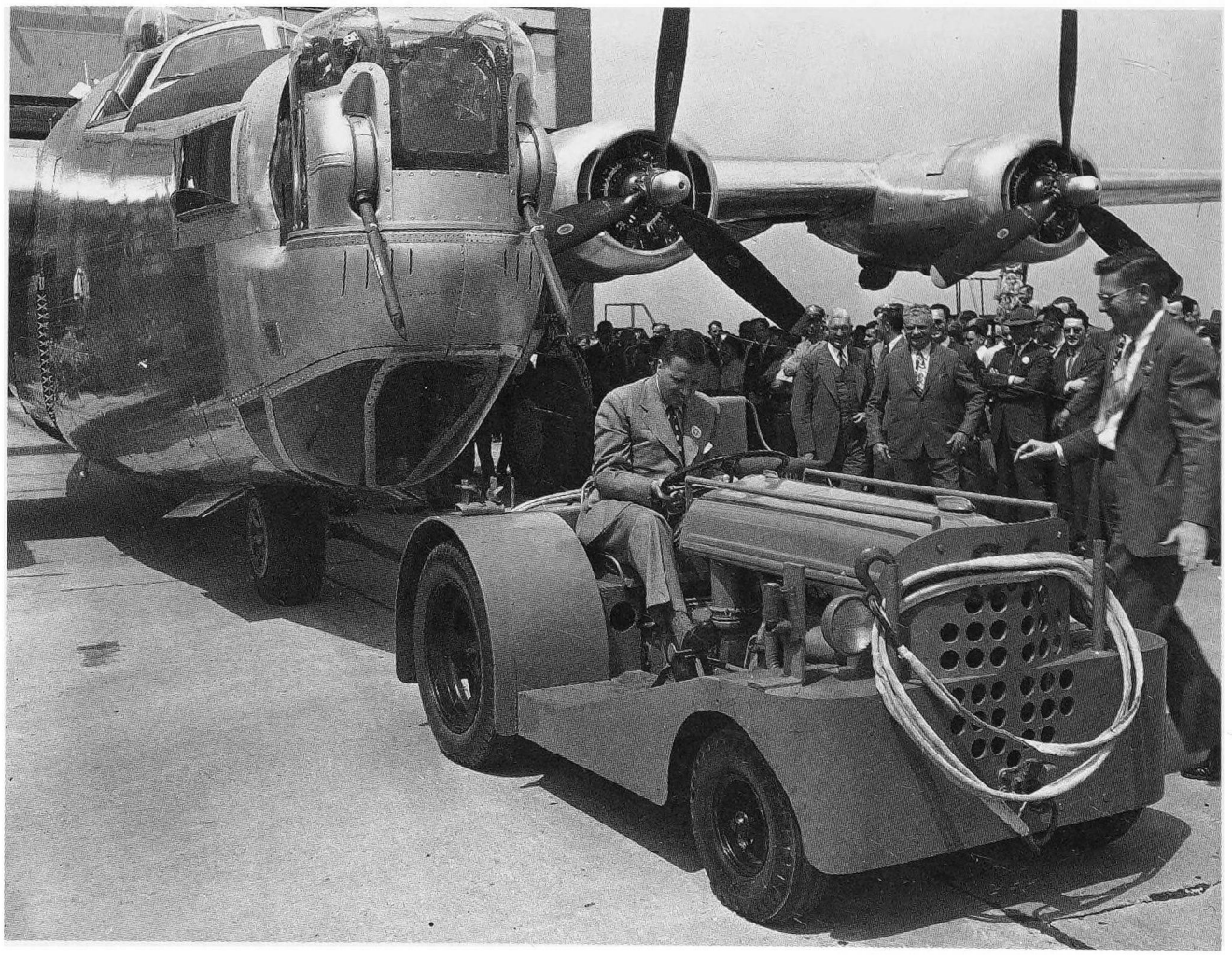
Most of the 1,677 B-24M aircraft built by Ford are distinguishable by the large window that slightly protrudes from the side of the nose. Convair's 916 B-24Ms, by contrast, featured smaller "standard" scanning windows.

Crewmen enjoyed much-improved visibility when a revised cockpit canopy was introduced, beginning with production block 20.

Although Ford did make one single XB-24N (serial number 44-48753) and seven YB-24N aircraft, all of which were distinguished by their large, single tail, the B-24M was the last mass-produced Liberator. It was also the last to see combat. With B-29 Superfortresses doing most of the bombing work in the Pacific theater, Germany's surrender in May 1945 quickly brought B-24 output to a halt; the Convair plant in San Diego rolled out its last B-24M in June of that year. A total of 124 B-24Ms that were to have been supplied by Ford were canceled before delivery. Many new B-24M bombers flew directly to storage, and a few even flew directly from the assembly line to salvage in Kingman, Arizona.



The last model of Liberator to be produced in quantity was the B-24M, with manufacturing divided between Consolidated San Diego and Ford Willow Run from October 1944 to June 1945. Armaments included an Emerson nose turret and Consolidated A-6B tail turret. This B-24M was assigned to the Royal Australian Air Force and lacked a dorsal turret.
Stan Piet collection



Marking the end of a monumental job, Henry Ford II, who would become president of Ford Motor Company in only three months, drives an aircraft tug towing the final Liberator built in the company's Willow Run plant, a B-24M-30-FO, on June 25, 1945.
National Museum of the United States Air Force

In a ceremony marking the end of Liberator production—and also the beginning of unemployment for many gathered in this photo—members of the crowd sign their names on the side of the fuselage. From this angle, the simplified windshield introduced on the B-24M is shown to good advantage, as is the wide, bulged scanning window for the navigator. *National Museum of the United States Air Force*

"Puddle Jumper II" was the nickname of this B-24M-5-CO, serial number 44-41946, assigned to the 819th Bombardment Squadron, 30th Bombardment Group, in the Pacific theater. The nicely executed nose art featured a scantily clad pinup holding an umbrella that has blown open. The navigator's side window is a rectangular, bubble type. The tail number, 441946, is faintly visible above the black stripe on the vertical tail. *Roger Freeman collection*

Nicknamed "Mamy Yokum II," this B-24M-20-FO, serial number 44-51113, was a product of the Ford Willow Run plant. The bomber was assigned to the 424th Bomb Squadron, 307th Bombardment Group, of the 13th Air Force. Shortly after VJ-day, the aircraft was flown to Kingman, Arizona, first for storage and ultimately for scrapping. *Stan Piet collection*

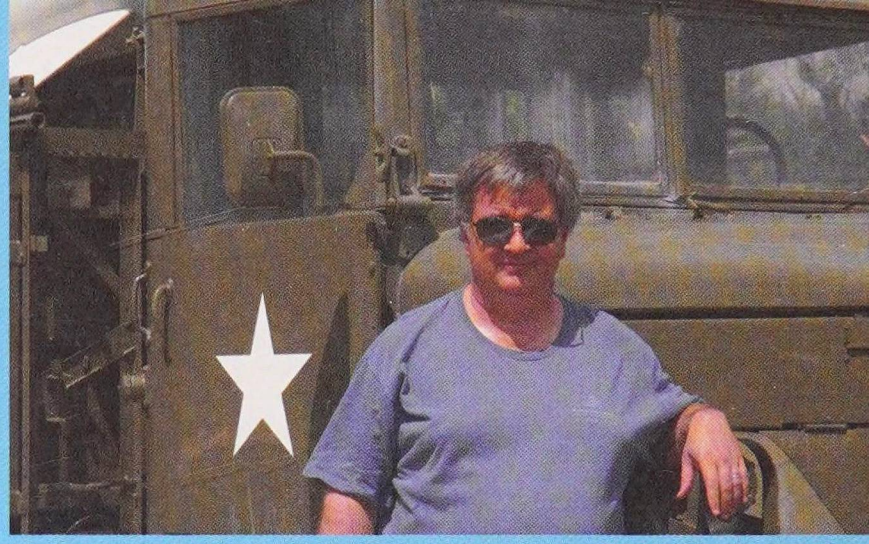
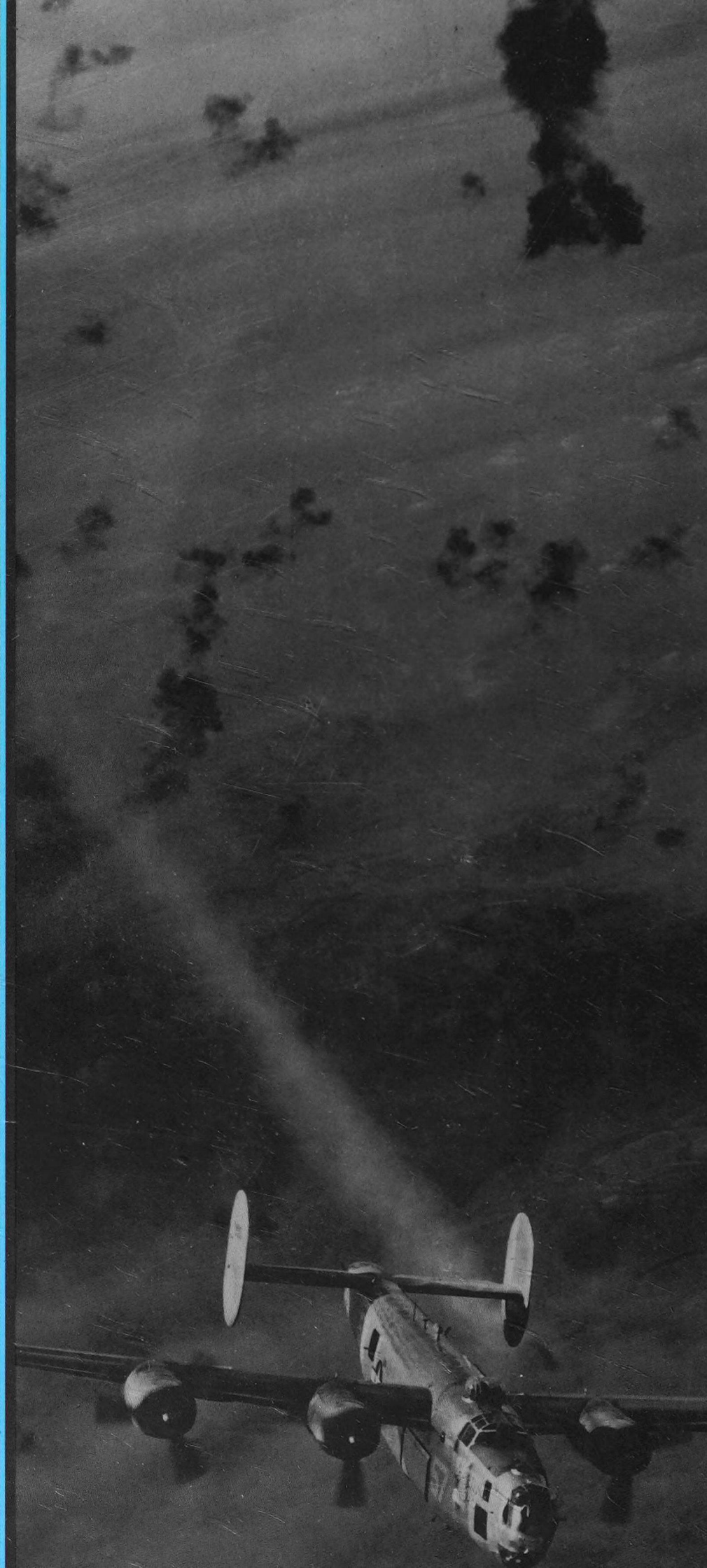


Photo of author (Courtesy of Denise Doyle)

David Doyle's earliest published works appeared in periodicals aimed at the hobby of historic military vehicle restoration. By 1999 this included regular features in leading hobby publications, appearing regularly in US, English, and Polish magazines. Since 2003, over 100 of his books have been published. Broadening his horizons from his initial efforts concerning vehicles, he soon added aircraft and warships to his research objectives.

SCHIFFER MILITARY
Printed in China

The B-24 Liberator remains to this day the world's most produced heavy bomber and multi-engine aircraft, and the most produced military aircraft in US history, with almost 19,000 examples leaving the assembly lines of five plants. Through a broad range of photos gathered from around the world, this book, the second of two volumes on the B-24, chronicles the design, development, and wartime use of the iconic late-production aircraft featuring gun turrets on the nose. The story of these iconic WWII aircraft is told through carefully researched photos, many never before published, that are reproduced in remarkable clarity. Large, clear images, coupled with descriptive and informative captions, unlock the secrets of this aircraft.



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